



Gough Bell  
Yorkshire

p. 36.



# NORTH YORKSHIRE.





**MAP OF**  
**NORTH YORKSHIRE**  
 TO ILLUSTRATE  
 THE DRAINAGE DISTRICTS

Scale of Miles.

# NORTH YORKSHIRE;

STUDIES OF ITS

BOTANY, GEOLOGY,

CLIMATE AND PHYSICAL GEOGRAPHY.

BY

JOHN GILBERT BAKER.

WITH FOUR MAPS.

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TO  
HEWETT COTTRELL WATSON,  
AUTHOR OF "CYBELE BRITANNICA," &c., &c.,  
IN TOKEN OF APPRECIATION OF HIS LABOURS TO  
SYSTEMATISE AND ELUCIDATE THE GEOGRAPHY OF BRITISH PLANTS,  
THIS WORK IS INSCRIBED BY HIS PUPIL  
AND SINCERE FRIEND,  
THE AUTHOR.

## PREFACE.

---

THE notes of which this volume contains a summary have been accumulated very gradually. I was born in the Riding about which I have undertaken to write, and have always looked to it as my home. From year to year I have visited the different parts of it, usually studying more or less attentively its natural features and productions, and latterly I have paid more systematic attention during my excursions to the subjects to which this book is devoted, endeavouring, as much as might be, when I have had suitable opportunities, to attend to those points which fall within their scope respecting which information was not already obtained and placed on record.

What I have endeavoured to furnish has been such an account of North Yorkshire botany, geology, physical geography and climate, as might be consulted and read by those who are not practically acquainted with the Riding, and might render the work suitable to be used as a handbook and guide-book by residents and visitors.

Information, both published and unpublished, respecting the various subjects treated upon, I have of course appropriated and received from all available sources. The monographs of Professor Phillips on the Geology of Yorkshire have long since taken their place in the standard literature of the science: and his more recent "Rivers, Mountains, and Seacoast of Yorkshire" will be doubtless known to most of those in whose way this volume is likely to fall. And my obligations to Professor Phillips are not only in respect of these, but he has also most kindly looked over what I have written with regard to Geology. With each of the tables that relate to local climate the personal authority upon which the figures rest is stated. Of the books and collectors relied upon for details of bota-

nical topography, a list is given at the end of the list of species. To the numerous kind friends who in so many various ways have aided my undertaking I would tender here my best thanks: and at the same time would wish to assure both those to whom I am already indebted, and any others who may take an interest in the subject, that corrections or further information will be received gladly, and used if ever a second edition of the book should be required.

Market Place, Thirak,

3mo. 1, 1863.

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# NORTH YORKSHIRE:

STUDIES OF ITS BOTANY, GEOLOGY, CLIMATE, AND  
PHYSICAL GEOGRAPHY.

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## INTRODUCTION.

North Yorkshire, as the term is here employed, comprises the North Riding of Yorkshire, properly so called, and also the Ainsty and City of York. For legal purposes the City of York is a County by itself, and the Ainsty is now a wapentake of the West Riding, but North Yorkshire as here understood is the parliamentary district which is designated by that name. It is bounded on the north by Durham, on the west by Westmoreland, on the south by the West and East Ridings of Yorkshire and on the east by the German Ocean. It includes a surface of irregularly rhomboidal contour, 2112 square miles in area, which measures at the utmost 88 miles from east to west, and 53 from north to south. Only three of the English counties are larger than it is; and these are Devonshire, Lincolnshire and Norfolk. Physically it may be roughly described as a broad central valley running north and south between two ranges of hills. The western mass attains an elevation of about 2600 feet above the sea-level, and the range which is situated on the east of the central valley reaches nearly 1500 feet, the general slope of the surface being from north west to south east. The Riding embraces within its limits a very wide diversity of natural features; a coast line where long ranges of cliff succeed undulated banks of shifting sand and low flat tracts of marsh: a rich and well cultivated interior mapped out into fields of corn and grass, separated from one another by thick shadowy hedgerows and diversified

by woods and rivers; and above the valley on either side rise extensive tracts of moorland country, bleak and heathery throughout its higher levels, intersected by pleasant dales and clear sparkling streams, its summits girdled with long lines of rugged and precipitous scar. Its industry of the productive kind is mainly of an agricultural stamp, that which does not ally itself to farming in some of its branches being principally employed in connection with the iron trade and with shipping, and there are no manufactures or coal mines of any considerable extent within its limits. York, with its castle and cathedral and old historic memories, is its only city, and has within its parliamentary limits a population of 45,000. Then come the maritime towns:—Middlesborough, a port for the Durham coal-field, and the nucleus of the Cleveland iron district, which has risen during the present century from a solitary farm-house to a town of upwards of 30,000 inhabitants; and next in order Scarborough and Whitby, the two latter principally known as fashionable sea-side resorts in summer time, with 18,000 and 12,000 inhabitants respectively. Next follow the four agricultural boroughs, Malton, Thirsk, Richmond and Northallerton, with populations ranging from eight thousand to under five, and the borough in each case, including adjacent villages in addition to the actual town. And besides these there are fourteen agricultural market towns, with populations ranging from upwards of 2500 to under 700, which in order of population are as follows, viz:—Pickering, Easingwold, Guisborough, Stokesley, Kirby-moorside, Hawes, Yarm, Helmsley, Reeth, Bedale, Masham, Middleham, Leyburn, and Askrigg. The average population of the whole of North Yorkshire at the last census was 135 to a square mile.

The past history of the inhabitants of the district, of their rulers and other notabilities, of their wars and progress in the various arts of civilization, its castles, abbeys, camps and other antiquarian remains have been treated very thoroughly in various well known works. Here it is proposed not to enter into these subjects at all, but to confine the attention to the physical features which the field of study itself presents; in the first place to consider the circumstances and details of the internal structure, physical geography and climate of its various districts; and afterwards to enumerate the plants of the higher orders which it produces and treat respecting the distribution of these over the various parts of its surface, at the same time endeavouring to trace out in what way the facts connected with the distribution of the plants connect themselves with and serve to indicate conditions of climate and geological constitution.

PART FIRST.



28 November 1904



## PART FIRST.

### GEOLOGY, CLIMATOLOGY AND LITHOLOGY.

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#### CHAPTER I.

##### GEOLOGY.

\*With the exception of a small tract of Basalt in Upper Teesdale, and a narrow dike or terrace of the same nature which extends from the lower part of the same valley of Tees to penetrate the Cleveland moors, all the subjacent rocks of North Yorkshire are of the kind which owe their origin to the gradual deposit of sediment from water. Except in the shape of loose fragments in the glacial diluvium we have not either Slate, Granite, or Chalk: and although Tertiary deposits are met with just beyond our boundary, except the glacial diluvium all the sedimentary deposits which occur within the limits of our field of study belong either to the Primary or Secondary periods. In order of deposition they range either from west to east, or from north-west to south-east, so that a person travelling in a direct line from the Derwent valley, opposite Filey, to the summit of Cronkley fell in Teesdale, would pass over each of the series of strata in succession and each change would be from rocks of a more recent to those of an earlier date of deposition, or if he were travelling in an opposite direction each change would be from rocks of an earlier to those of a later date. The following table will shew their order and geological classification.

\* For fuller information on this subject see Phillips' "Illustrations on the Geology of Yorkshire," (an elaborate work in two volumes quarto, with numerous coloured sections and figures of fossils) and the same author's "Rivers, Mountains and Sea-coasts of Yorkshire," Sedgwick's Monograph on the Magnesian Limestone in the transactions of the Geological Society, new series, vol. 3, p. 37-118; and Williamson on the fossils of the Yorkshire coast, Geol. Trans. n. s. vol. 5.



## TABLE OF THE STRATA OF NORTH YORKSHIRE.

NAMES.	LOCALITIES.
I. <i>Primary or Palæozoic period.</i>	
A. CARBONIFEROUS SYSTEM.	
1. Mountain Limestone . . . . .	Wensleydale, Swaledale, Greta-dale, Upper Teesdale.
2. Millstone grit . . . . .	Cotherstone, Masham, Colsterdale, Deepdale, and summits of most of the western hills.
B. PERMIAN SYSTEM.	
3. Magnesian Limestone . . . . .	Piersebridge, Tanfield, Thorp-Arch.
II. <i>Secondary or Mesozoic period.</i>	
C. TRIASSIC OR SALIFEROUS SYSTEM.	
4. New Red Sandstone . . . . .	York, Thirsk, Croft, Northalerton, Yarm.
D. OOLITIC SYSTEM.	
5. Lias . . . . .	Whitby, Redcar, Guisbro', Stokesley, Easingwold.
6. Lower or Bath Oolite . . . . .	Summits of the Cleveland hills and flanks of those between Thirsk and Scarbro'.
7. Middle or Oxford Oolite . . . .	Summits of the tabular range of hills between Thirsk and Scarbro'.
8. Kimmeridge Clay . . . . .	Helmsley, Pickering, Kirby-moorside.

*The Carboniferous System.* A line drawn from Pierse bridge on the Tees, to Tanfield on the Yore, bounds on the east that part of North Yorkshire which is underlaid by the Primary rocks. The Carboniferous system taken as a whole makes up the entirety of the western mass of moorlands. Its oldest, or Mountain Limestone series of strata may be conveniently treated under two divisions, a lower and an upper set of beds and it is in the midst of the former that the Teesdale basalt is intruded and has its place.

*The Lower Mountain Limestone or Scar Limestone series.* This lower limestone is more or less exposed to view in the depths of each of the three principal dales of the western moorlands, Teesdale, Swaledale, and Yoredale. A long line of strongly marked dislocation passes northward from the Ingleborough district to the mountains round the source of the South Tyne, an idea of the tremendous character of which may be gathered from the fact that for a length of forty-five miles the strata are displaced to the

extent of at least three thousand feet. An observer stationed upon the elevated edge on the east of this line (as for instance, upon the summit of Wild Boar fell, or Swarth fell, which are situated in Westmoreland, just opposite the head of Yoredale) stands upon millstone grit strata, with a thick mass of mountain limestone beneath them, and sees outstretched 2000 feet below him the valley of the Eden and the plain of Carlisle, where these same mountain limestone and millstone grit beds are buried beneath superincumbent deposits of New Red Sandstone. From this main line of dislocation, which is known by the name of the Pennine fault, two cross lines strike out at right angles towards the east. The northern one of these is about fifty miles in length, and is continued from Brampton in Cumberland to the Northumbrian coast near Cullercoats, relatively depressing the strata on the north and elevating those on the south of it to an extent which cannot be estimated at less than two thousand feet. The southern line, or rather a double southern line, reaches about thirty miles and may be distinctly traced as far eastward as Wharfedale, in the same way relatively depressing the strata on the south and elevating those on the north of it from one to three thousand feet.

It is along the line of the Pennine fault, and in the Craven country about Settle that this lower mountain limestone is seen to the best advantage. Here it forms a compact calcareous mass about 400 feet in thickness, with very little or hardly any interpolation of non-calcareous material, with numerous vertical fissures, and in some places, as for instance on the south-eastern slope of Ingleborough, it may be seen with its lower beds full of broken slate boulders resting upon masses of dark coloured Silurian slate. The steep precipices which girdle Langstrothdale, Littondale, Gordale, Ribblesdale, Ingletondale, and Kingsdale, and the thick mass of caverned and fissured limestone that forms the general base of the well known Craven hills, Fountains fell, Ingleborough, Pennyghent and Whernside must all be referred here. Along the western border of the county it forms the lower part of the great Pennine escarpment, still shewing fine limestone scars as far north as the country round the head of the Tees. But as it passes towards the north, both along the edge of this line and in the interior of the moorland mass, it loses the distinctly marked calcareous stamp which characterises it in Craven, and the farther it goes in that direction, argillaceous and arenaceous bands are more and more mixed up with the limestone. In Pennyghent and Ingleborough its upper surface is 1300 feet and beneath Great Whernside it is 1400 feet above the sea-level. At the head of the Ribble it has sunk to 1000 feet, and

between this point and the south side of Yoredale opposite Hawes it declines 150 feet more. Altogether in Yoredale about 240 feet of its upper portion is exposed. It fills up the lower part of the valley from the Hawes neighbourhood as far east as Redmire, a distance of twelve miles. Its limestones form the long low terrace that borders the road between Askrigg and Carperby, the falls about the village of Gale, the picturesque rapids of Aysgarth and may also be seen exposed round the sides of Seamer Water. Here the interpolations in the limestone are principally argillaceous and may be best seen about Askrigg and above Aysgarth Bridge, and bear altogether to the limestone a proportion of about two to three. From Great Whernside to Aysgarth it declines 700 feet in eight miles. On the north side of Yoredale opposite Hawes we have the upper surface of this lower limestone at about 800 feet above the sea level, and in Swaledale about the same height a small portion of the upper part is exposed to view in the neighbourhood of Muker. From this point northward it is not anywhere to be seen till we reach Upper Teesdale. In the Micklefell tract the upper beds may be seen immediately above the Basalt. Here the upper band of limestone is from 25 to 50 feet in thickness, and is known by the name of Tyne bottom limestone. In Cronkley fell it reaches an elevation of 1750 feet, but from this point it is much depressed by dislocations both towards the north and east, and southeast of the great fault which ranges along Lunedale it is lost altogether. By proximity with or contiguity to the Basalt the various strata become much changed in character, the shales prismatised, both the sandstones and shales bleached and rendered brittle and the normally compact calcareous beds which immediately overlies the basalt are metamorphosed, as in Cronkley fell, into a loosely granular "sugar limestone." A few miles further north the rich mining tract of Alston Moor furnishes the following section of the beds of this series :

	feet.
Tyne bottom limestone.....	24
Alternations of shales and sandstone....	74
(Here the Basalt occurs)	
Jew lime .....	24
Alternations .....	26
Little Lime .....	18
Alternations .....	90
Smiddy Lime.....	31
Sandstone .....	12
Limestone .....	25
Alternations .....	21

	feet
Robinson's lime.....	21
Alternations .....	12
Great limestone of Melmerby Scar....	132
Alternations and coal .....	24
Limestone .....	12
Alternations .....	165
Limestone .....	7
Alternations and coal .....	221
Limestones .....	18
Alternations .....	234

Total thickness of the series 1191 feet.

312 feet calcareous, 879 feet non-calcareous.

*The Teesdale Basalt or Whin sill.* A huge mass of rock which has owed its origin to igneous agency, and which is known locally by the name of the \*Whin Sill, extends from the neighbourhood of Brough in Westmoreland into the district round the head waters of the Tees, Wear and Tyne, and from thence, with some interruptions, is continued as far north as the Northumbrian coast near Alnwick. It attains its greatest developement at the Caldron Snout, where it is from 200 to 300 feet in thickness, being in Tynedale about 120 feet thick, and at the head of Hilton Beck, which is only six miles westward from the Caldron Snout, becoming diminished to 24 feet. Generally the deposit is remarkably layer-like in character, conformed to the plane of the stratification of the neighbouring sedimentary rocks, and in Teesdale and Tynedale it would seem to be nearly or quite uniform in its geological position, which is always below, but not far below, the Tyne bottom limestone which forms the uppermost band of the series of beds which has just been noticed. Generally it is fine in grain and dark in colour, and forms rudely prismatic vertical columns. At the Caldron Snout, where the foaming waters of the Tees leap down a basaltic ravine two hundred feet in depth, this columnar structure may be seen to the best advantage, and it may be observed upon a smaller scale in the falls of Blea beck. Spreading from the Caldron as a centre, in our district the Basalt ranges up Maze beck for two miles, attains a considerable elevation above the river in Cronkley Scars and may still be seen in the river-bed as far down as the High force and Winch bridge. At the High force the top of the waterfall is Basalt and the lower beds indurated and subprismatic shale, with beds of limestone below.

\* Whinstone is the local name for basaltic rock, the Scottish quhyn-stane. Sill is the Saxon syll, syle, the French seull, the flat piece of timber or stone at the foot of a door or the bottom of a window.

Leaving the Tees lower down it ranges along the south side of the dale past Holwick and Unthank, and at last is lost about a quarter of a mile from the Tees half a mile from its junction with the Lune. The whole district is full of the marks of eruptive force and the influence of great dislocations. Its four principal faults will be noticed more particularly when we come to speak of the Upper Mountain Limestone. From the upper part of Lunedale two basaltic dikes pass near the end of the great basaltic mass and are prolonged in a north-eastern direction to the Durham coal-field. The uniformity of the geological position of the Whin sill, taken in connection with the stratiform character of its great mass and its general conformity to the plane of the stratification of the neighbouring sedimentary beds, would seem to point to its having been poured out amongst them during the time of their deposition, but even if this be the case with regard to the Teesdale Whin-sill, there can be no doubt that in the tract of country of which we have been speaking, overflowings and outbursts of submarine lava have occurred at different epochs.

*The Upper Mountain Limestone or Yoredale series.* The most characteristic section of the upper mountain limestone series of strata is to be met with in the upper part of Yoredale, (or as it is more commonly called locally, Wensleydale,) in the neighbourhood of Hawes. In the fells upon both sides of the dale it reaches a thickness of nearly one thousand feet, and is made up of not less than five distinct bands of limestone, with intermediate beds of non-calcareous constitution as follows, viz :—

	feet
The main or twelve fathom limestone .....	70
Laminated grit and plate with ironstone and coal	80
The underset limestone .....	30
Gritstone, flagstone and plate with coal and impure limestone	350
The middle limestone .....	30
Gritstone, flagstone and plate .....	150
The Simonside limestone .....	20
Flagstone, gritstone and plate .....	100
The Hardraw limestone .....	40
Gritstone and plate .....	100

Total thickness of the series, 970 feet.

190 feet calcareous, 780 non-calcareous.

Of these bands of limestone, the Main or upper is the most conspicuous, the Middle and Simonside bands least so. Everywhere in the neighbour-

hood of Hawes the Main Limestone may be seen at a height above the sea of about 1800 feet. As we proceed from Hawes southward in the direction of Craven, we have, as before stated, the plane of the stratification of the lower mountain limestone series sloping upwards and at the head of the Ribble 150 feet higher than at Hawes. In this direction the space between the Main and Underset bands of limestone grows thinner, till at last they are united together into one mass on the south side of Cam fell. As the series is shown on the north side of the great Craven fault, a still further contraction of the non-calcareous interpolations as compared with the Hawes section is seen. In Pennyghent the upper surface of this Yoredale series is 1900 feet above the sea-level and its beds as under, viz.

	feet.
The upper or Cam limestone .....	60
Gritstone, flagstone and plate .....	225
The middle limestone .....	20
Plate, &c. ....	92
The Simonside limestone .....	20
Gritstone and plate .....	62
The Hardraw limestone, with thin plates ..	40

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519 feet.

In Ingleborough the section is similar to this last, but the upper limestone is about 200 feet higher than in Pennyghent and considerably thinner. It forms a scar about 30 feet in thickness, which may be seen to advantage on the crest of the Ingleton or western slope of the mountain.

From Hawes proceeding towards the east down the Yoredale valley we have on the south side of it the Underset limestone at an elevation of 1565 feet forming the summit of Addleborough, and along the line of drainage which forms the southern boundary of the Riding, the Main limestone maintaining an elevation of about 1900 feet from Widdale fell along Cam fell as far east as the head of Bishopdale. But between this point and the Wharfedale slope of Great Whernside, where the lower limestone is 1400 feet high, the Yoredale series has declined in level upwards of 200 feet by the upper limestones having become completely obliterated and the non-calcareous interpolations between the lower beds having also vanished almost entirely, as the following section shews.

	feet.
Plate .....	84
Limestone with partings of plate.....	111
Plate .....	4
Dark limestone .....	78

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277 feet.

This is the section of the Yoredale series on the Wharfedale side of Great Whernside, but on the Coverdale side of the mountain and at the summit of drainage between Coverdale and Wharfedale the upper limestones may be seen making their appearance and rapidly attaining a considerable thickness, so that on the west side of Coverdale the Main limestone is from 30 to 40 feet thick, and these, with the non-calcareous bands which are interpolated between the lower beds, in the space between the Wharfedale side of Great Whernside, and Starbottom, a distance of only three miles, swell the series from 277 to 510 feet. Along the whole length of Coverdale, a distance of 15 miles, the non-calcareous beds above the middle limestone, which in the Hawes district attain a thickness of 430 feet are only augmented to 150 feet, whilst towards the east they are diminished to 30 feet and towards the south and south-east vanish altogether; and in like manner the non-calcareous beds below the middle limestone, which at Hawes are 350 feet in thickness, in Coverdale are reduced to 150 feet and towards the lower part of Wharfedale, in a south-eastern direction, cease altogether; a state of things plainly pointing to the conclusion that in this district at this particular epoch the deep sea was towards the south-east and its shores towards the west and southwest.

At the west end of Penhill we have the Yoredale series from 600 to 700 feet in thickness, with all the principal beds of the Hawes section present, but the grits and plates above the Middle limestone much reduced in thickness. On the Coverdale side of Penhill the Main limestone has sunk to 1100 feet above the sea-level, and the Hardraw limestone ranges from the end of Bishopdale past West Witton and dips beneath the surface in the bed of the Yore near Bolton Hall. By the time we reach Middleham moor the Main limestone has declined to 850 feet, and at East Witton to 400 feet above the sea-level. Here it is extensively quarried and is about 20 feet thick. It may be traced along the whole length of both sides of Coverdale, in the lower part of the dale forming a terrace, on the surface of which the high road is carried in some places; and as we proceed from these points further east the series is altogether buried beneath the Millstone Grit.

On the north side of the Yoredale valley, the Hardraw limestone may be best seen at the waterfalls called Hardraw force and Millgill force, the Upper limestone best at Leyburn Shawl, and between Askrigg and Carperby, and most of the lower members of the series may be examined at the lead mines at Ellerbanks near Carperby and at the Keld heads near Preston-under-scar. At the former locality the Main limestone forms a double

scar at an elevation of about 1200 feet and the Underset limestone from 1125 feet is thrown down by a dislocation to 1000 feet. At Preston the succession of the beds below the Middle limestone, as given to me by Mr. Craig, of Aysgarth, is as follows, viz—

30 feet—Middle limestone, rich in ore	Plate
Gritstone	Grit
Coal seam 1 foot thick	Plate
Plate	Thin lime
Grit	Ironstone, thin
Flagstone worked above Carperby	Plate
Large Plate	Grit
Thin Lime	Small plate
Strong gritstone	Plate and Ironstone
Small plate	Grit
Post of grit	Small Plate
Plate	60 feet—Hardraw limestone
20 feet—Simonside limestone	Grit
Grit	Plate.

From an elevation of 1700 feet in Cotterfell and the south side of Lovely Seat, the Main limestone declines gradually eastward to 1025 feet at Preston, 836 feet at Leyburn Shawl, and 700 feet at the town of Leyburn. Through the mass of moor between Yoredale and Swaledale, the course of the series is nearly level or declining slightly towards the north. On the south side of Lovely Seat the Main limestone is upwards of 200 feet lower than in Cam fell and Bear's Head, and on the north or Swaledale side of the same hill it is 1554 feet in elevation, with 660 feet of the Millstone Grit beds over it. Between this point and Muker the Yoredale series is exposed in Cliff gill, with a total thickness of nearly 700 feet, with all the limestones of the Hawes section present, the upper band 82 feet, and the underset band with chert on the top of it, 54 feet in thickness, but the lower limestones thinner than at Hawes; and the non-calcareous interpolations above the Middle limestone 237 feet thick, instead of 430 and those below it 210 feet instead of 350. The head of the pass between the dales of the Swale and the Eden is 1700 feet in elevation, and the mountain peaks that encircle it are about 600 feet higher, and here also the Main limestone is between 1500 and 1600 feet in elevation. East of Lovely Seat it attains 1600 feet in Satron Hangers, and from thence sinks eastward to 800 feet in Downholme moor.

A few miles from the head of Swaledale the valley divides into two, and the two branches rejoin each other at Muker. A fine ridge of hill which



bears the name of Keasdon is thus insulated, and here the Yoredale series may be well seen, the Main limestone forming the summit of the mass at its southern extremity, but having a cap of Millstone Grit over it at the north end of the ridge, which reaches an elevation of 1643 feet. The tract between the Swale and the Greta is a rich and long worked lead-mining country, with many dislocations. In Nine Standards the Main limestone attains about 1700 feet. Ascending Water Crag by way of Stonesdale, we have the Underset limestone at an elevation of 300 feet above Muker and 1150 feet above the sea-level; above it about 60 feet of non-calcareous interpolation, 80 feet of Main limestone and between this and the hill summit in this direction nearly 900 feet of the beds of the Millstone Grit series; but on the eastern or Arkendale side of the same hill the Main limestone is nearly 100 feet higher, its upper surface in Punchard's Gill being 1360 feet in elevation, with the base of the under-set limestone 190 feet below it, and 230 feet more of the lower beds before we reach the bed of the stream. Towards the south-east the Main limestone reaches 1600 feet in the angle between Arkendale and Swaledale above Reeth. Along the line of the former dale, which runs from the north-west towards the south-east, a fault depresses the beds in a north-eastern direction, and in Fremington edge we have the Main limestone at 1150 feet and the Middle limestone at 200 feet above the river. From this point through the moorlands eastward to the Castle-hill at Richmond, a distance of eight miles, the Main limestone sinks gradually to 450 feet.

In the dale of the Greta we have only the upper half of the series visible. The Middle limestone may be seen in the deeply excavated river bed near Rutherford Bridge and the flagstones above it are quarried extensively about Brignal and Scargill. The junction of the Tees and Greta is in the Main limestone at an elevation of 380 feet, and the same rock, with its beds dipping steeply towards the north, forms the \*bed of the Tees beneath the well known Abbey bridge of Eglestone, and the equally well known scars that margin the Greta in Rokeby Park. From this point the Main limestone may be traced along the edge of the fells

• "That mighty trench of living stone,

Where Tees, full many a fathom low,  
Wears with his rage no common foe,  
Nor pebbly bank, nor sandbed here,  
Nor clay-mound checks his fierce career,  
Condemn'd to mine a channel'd way  
O'er solid sheets of maible grey."

SCOTT'S *Rokeby*.

which border the dale of the Greta to an elevation of nearly 1000 feet at Bowes, and from thence along the south side of the dale by way of Gilmanscar, past the summit of drainage between Arkendale and Swaledale to Gilling, and from thence back again to Rokeby, beneath Gatherley moor by way of Forsett and Hutton Magna : and a small isolated tract of limestone is also to be seen on the east of the gritstone at Middleton Tyas.

Between Gretadale and Lunedale there is a synclinal fold or trough in the Mountain limestone, dipping from the south and north towards Deepdale and Balderdale, so deeply that in this tract of country the Yoredale series is altogether buried beneath superincumbent masses of Millstone Grit. Along the line of Lunedale a fault runs which elevates the strata on the north of it to the extent of about 1000 feet. Another fault passes from the Caldron Snout along the line of Maze beck between Mickelfell and Birkdale, elevating the strata on the south-east, and a third along the line of the main dale of the Tees throwing up the beds towards the south, which in the neighbourhood of Middleton causes a difference of some hundreds of feet between the elevation of the beds on the opposite sides of the dale. So that the triangular tract of country enclosed between the Tees, the Lune and Maze beck consists of a pyramid of beds of the Yoredale series elevated upon a floor of Basalt and Lower Mountain limestone lifted considerably higher than the corresponding strata in the country which immediately surrounds it. The Main limestone forms the general plateau of the culminating Mickelfell ridge, and there is a cap of sixty feet of gritstone over it at the western or highest end of the ridge, which is the highest point in Yorkshire, and which reaches an elevation of nearly 2600 feet. The height reached by the Mountain Limestone in the Teesdale district is its maximum elevation in Britain. Here the Main limestone is 70 feet thick and the Underset limestone 24 feet thick, with a space of about 80 feet between them. Complicated dislocations, especially the three faults to which reference has just been made, and a fourth which is called the Burtree ford dike, and which ranges from Langdon Beck across the east end of Falcon Clints and Cronkley Scars towards the head of Lunedale, causing a downthrow on the east to the extent of about 200 feet, produce great confusion in the stratification of the lower beds of the series. These vary considerably in thickness in different places, the greatest thickness anywhere attained by a lower limestone being 40 feet and the space between the underset limestone and the Tyne bottom limestone ranging from about 300 to 600 feet. Between the Main limestone of Mickelfell and the Tyne bottom limestone of the White

force, there is a difference in level of 850 feet, but here the Burtree ford dike intervenes. In Alston moor the Yoredale series is 495 feet thick, 350 feet of which is made up by non-calcareous beds, the principal of which are two bands of hard gritstone called respectively the Brigstone hazle and the Nattriss gill hazle.

*The Millstone Grit series.* For a typical section of this series as we have it in North Yorkshire we must go either to Colsterdale on the east of Great Whernside, or to where the beds of this series fill up the great synclinal depression between Swaledale and Lunedale, the existence of which has been indicated when speaking of the subjacent strata; or better still, to the hills which surround the lower part of Wharfdale and Nidderdale, where we shall find it thicker and better developed than it is anywhere within our own proper limits. The various members of the series are very different in different localities, so that it is often a task of great difficulty to decide respecting the identity of the beds, and their proper relation to one another. In the Ilkley and Pateley bridge tract the series attains in some places a thickness of fully one thousand feet, with strata as under, viz;—

	feet	feet
1. Upper grit of Brimham Rocks and the Wharfdale summits	100 to	360
2. Upper plate and flagstone group with chert and coal, about	200 or	250
3. Coarse middle or Sandhill grit.....	30 to	50
4. Lower plate group, with gritstone, thin limestone & coal	300 „	350
5. Lower or Ingleborough grit, with plate and coal .....	100 „	300
6. Chert, limestone and plate beds .....	12	

The following is the detailed Witton fell and Colsterdale section as observed in the Brown beck collieries, the gritstone of the surface apparently corresponding to the middle grit of Nidderdale and Wharfdale, and the lower beds representing the lower plate group.

	feet	inches
Strong gritstone of Agra Crag .....	51	6
Ochry soft sandstone .....	1	9
Platy grit .....	4	6
Bluish laminated grit and plate.....	63	
Grey sandstone and blue soft stone ....	4	11
Platy grits and alternations .....	33	
Solid grit rock.....	7	
Platy grit .....	6	
Solid grey sandstone .....	5	
Dark plate .....	34	
Hard grey laminated stone.....	21	

	feet	inches
Coal .....		3
Hard grey stone with round balls .....	18	9
Crinoidal limestone .....	15	
Hard yellowish cherty stone .....	6	
Blue plate .....	5	
Coal .....	1	4

Total thickness of the lower plate group above  
main coal seam. } 225 feet

In Great Whernside the series is about 600 feet thick, the beds of the summit representing the upper plate and flagstone group of Nidderdale, and the lower grit ranges down both sides of Coverdale, with the middle grit over it in isolated patches to form the highest summits. From the edge of Coverdale proceeding eastward towards the central valley the mass of moorland slopes with considerable abruptness, and within a short distance of Masham some of the beds higher than the Middle grit make their appearance, and nearer Tanfield a gritstone is to be seen which most likely represents the Upper or Brimham gritstone. In Penhill the series is exhibited as follows, the grit of the summit still apparently representing the Middle grit of Nidderdale, but with the Lower Nidderdale grit shewn only in a very imperfect manner.

	feet
Grit rocks of the summit .....	150
Alternations of plate and flaggy grits with coal in the upper part } .....	250
Plates, flagstones, &c. ....	60
Little limestone, chert and plates ....	80

Total 540 feet.

In Buckden pike, where the surface of the Main limestone is 1850 feet above the sea-level, the Millstone grit series is only 450 feet in thickness, the summit rock being rather higher in the scale than that of Penhill. But as we proceed westward amongst the remainder of the hills on the south side of Yoredale we get only a small thickness of the beds of this series, and that is only shewn in the shape of ridges or isolated patches upon a great Mountain Limestone floor; as may best be seen in two of the hills in the immediate neighbourhood of Hawes, Dod fell and Bear's Head.

Between Yoredale and Swaledale the series is thickest towards the western and eastern extremities of the moorland mass, the Main Limestone

being left at or near the surface in the central portion of the range. In the five high summits on the edge of Mallerstang there are from 700 to 800 feet of Millstone Grit beds above the Main Limestone; on the south side of Lovely Seat 535 feet and on the north side 662 feet: and at Leyburn a coal seam upwards of a foot thick is obtained on the moor top about 120 feet above the Main limestone, which has a thick gritstone over it on the east, and in the neighbourhood of Downholme and Hudswell the same coal seam is also worked.

Next we pass to the tract of the great synclinal depression, and by combining two of the Arkendale mining sections, and taking for each bed its greatest thickness in either of the two we obtain the following result, viz.

		feet
No 3.	Millstone grit .....	120
	{ Plate .....	30
	{ Alternations of plate and limestone ..	37
No 4.	{ Flinty chert with alternations of plate	51
	{ Crow limestone .....	18
	{ Grit and plate with coal .....	25
No 5.	White gritstone .....	66
No 6.	{ Alternations of plate, limestone & chert	80
	{ Main chert .....	18

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Total 445 feet.

Here the top Millstone grit would appear to represent the middle grit of Nidderdale and the summit grit of Penhill and the Colsterdale watershed, and the white grit the lower gritstone of Nidderdale and Ingleborough, the rest of the beds being grouped and numbered in correspondence with the Nidderdale section.

On the Stonesdale side of Water Crag the series is upwards of 900 feet thick, and here we have above the Main Limestone 122 feet of the lower cherty group, 80 feet of the white grit, 110 of the upper cherty group, and 600 feet more of plates, middle grits and the upper plates and grits of Nidderdale before we reach the summit. In Nine Standards the Main Limestone is considerably higher than in Water Crag, and the gritstone thinner. At this point it is about 400 feet in thickness, and from thence along the summit of the escarpment over Mallerstang as far north as Stainmoor, the upper beds are still those which overlie the upper Arkendale grit. At the western edge of the county the road at the bottom of the Stainmoor depression is 1450 feet above the sea-level, in beds not far above the Main Limestone. On the north side of the Stainmoor hollow

the summits of the west and the peak of Goldsborough attain the middle gritstone ; and the general floor of the lower moorlands in the Lartington and Cotherstone tract is made up of the argillaceous beds below it. And north of the Lunedale fault the series is only seen in two caps over the Main Limestone of the Mickelfell ridge, one at its eastern, and the other, which is 60 feet in thickness and forms the highest part of the hill, at its western extremity.

*The Permian system. The Magnesian Limestone series.* Within the limits of our field of study along the whole length of the line of the edge of the Millstone grit beds none of the strata of the Coal measures are to be seen, although they make their appearance both in a northern and southern direction soon after North Yorkshire is left behind, and both South Durham and West Yorkshire yield rich and extensively worked coal fields. It would, from various considerations, seem probable that these two coal fields, though now separated by a distance of sixty miles, have been originally connected together and that they have formed parts of one and the same mass. Both of them are formed in a basin of Millstone grit and both are covered unconformably by the beds of the Magnesian limestone. Coals of like quality are worked in both of them in the same parts of the series and in both of them courses of Ironstone are plentiful in the lower and central portions of the formation. The long and varied range of deposits which we have already passed under review has evidently been laid down very gradually, and their deposition must have extended over a very lengthened period of time. But the era which immediately followed the end of that during which the beds of the great Carboniferous system were laid down has on the contrary been marked by a general eruption of disturbing forces, of the energy of which we may form some kind of an idea by studying the traces which they have left behind them in the tract of country with which we are here more particularly concerned. At Cullercoats the Tynedale fault dislocates a mass of Magnesian Limestone strata, but although such is the case we may confidently infer from the fact of the nonconformity of the plane of the stratification of the great mass of the Magnesian limestone deposits in Durham and throughout Yorkshire to that of the subjacent Millstone grit and Coal Measures, that it is to the earlier part of the Permian epoch that we must look as the period of the Craven and great Pennine dislocations, especially as the condition of the beds in the valley of the Eden altogether confirms this view of the case. So that we have the upheaval of the whole mass of our western moorlands in the manner which has already

been described and the entire sweeping away of whatever portion of the beds of the Coal Measure series may have been deposited on the east of them to appeal to as a criterion of the extraordinary power and activity of the forces which came into operation at the era at which we have now arrived.

It is this upheaval and denudation rather than the deposition of strata which constitute the groundwork from which we have to evolve the history of the Permian epoch so far as North Yorkshire is concerned. From the Midland Counties northward a terrace of Permian beds margins the Carboniferous deposits along the line of their eastern boundary. Through West Yorkshire this terrace is continuous and each of the rivers, in its course from west to east, breaks through it. In the south of the county it is usually several miles in breadth and in one place it attains 450 feet in elevation above the sea-level. At the south-west corner of the Ainsty the Magnesian limestone margins the Wharfe with cliffs at Thorp Arch and Newton Kyme. Passing northward by way of Knaresborough and Ripon it crosses the Yore half a mile below Tanfield Bridge.

North of the Yore the terrace is much narrower than in the neighbourhoods of Doncaster and Tadcaster. It soon rises to an elevation of 300 feet, with a conspicuous slope in an eastern direction. It ranges nearly in a straight line past Well and Nosterfield to a hill about two thirds of a mile west of Thornton Watlas and there the escarpment suddenly terminates. From Watlas to Little Crokehall there is no trace of Magnesian Limestone; it is either entirely swept away or else buried beneath the thick beds of diluvial gravel which overspread this tract. It is laid bare again in the bed of the rivulet at Little Crokehall, and again makes its appearance beneath a mound of diluvial gravel five miles further north by the side of the private road from Bedale to Catterick about half a mile from the latter locality; and is probably continued beneath the ridge which extends in the direction of Tunstall. It occurs also under thirty feet of diluvial gravel on the right bank of the Swale about half a mile below Catterick Bridge. In the flat country north of the Swale and along the edge of the hills of Mountain limestone at Middleton Tyas there are no traces of it, but it reappears in a hill about half way between Newton Morrel and Cleasby, and is again seen at Rennison quarry, near Eppleby and by the Tees' side west of Pierse Bridge it forms a cliff beneath 30 feet of diluvium. North of the Tees it forms a cliff at Coniscliffe, and from this point northward through the county of Durham the terrace becomes much increased in width. In the south of Durham it fills up the whole

of the space from Hartlepool westward to the North Eastern line of railway. It borders the Durham coal-field on the south east and becomes gradually narrowed as we proceed northward. About Sunderland and Marsden there are excellent sections in the coast cliffs and it finally ceases upon the coast a short distance to the north of Tyne.

Taking the series as a whole as represented in the North of England, its divisions are given by Professor Sedgwick as follows, beginning from above, viz. —

1. Red and white marls.
2. Thin bedded compact limestone, scarcely magnesian.
3. Red and white marls and gypsum.
4. Magnesian limestone in thick beds, in colour generally whitish or yellowish.
5. Marl slate in thin layers.
6. Yellow or purple sands, sandstones and marls.

The lowest bed is the Pontefract sandstone of Smith. Between the Wharfe and the Nidd it forms an advanced terrace ranging considerably to the west of the real Magnesian limestone. Here it is a coarse-grained, irregularly bedded purple sandstone, sometimes nearly approaching the appearance of a conglomerate, and decomposing into irregular masses, as may be well seen at Plumpton Rocks near Knaresborough. But in North Yorkshire this bed is nowhere to be seen distinctly, though numerous loose blocks which apparently belong to it occur in the diluvial detritus.

The fifth and the third beds also are not anywhere distinctly known in North Yorkshire. The fourth bed or true magnesian limestone forms a cliff 70 feet in thickness at Knaresborough and cliffs from 30 to 50 feet thick on the banks of the Wharfe and Tees. The upper part of these is a firm cellular concretionary magnesian limestone and the lower part is more soft and earthy in texture.

The second bed or upper slaty limestone is seen at Thorp Arch, and is represented at Well and Nosterfield by a system of smoke grey and dark bluish grey beds of limestone shattered so much as to resemble a highly indurated calcareous shale. The following is the section of Seven-acre quarry near Well from the main magnesian limestone bed upwards :—

- |   |       |
|---|-------|
|   | feet. |
| 1. Strong yellow magnesian limestone forming the base of the quarry. ....       |       |
| 2. Thin shattered beds of brownish blue limestone with thin seams of marl ..... | 12    |



	feet.
3. Earthy yellowish beds .....	3 or 4
4. Dark brown and black shale, highly calcareous and semi-indurated. ....	1
5. Yellow rubbly limestone with galena, worked in 1823, now deserted .....	1½
6. Dark shale passing into limestone. ....	½
7. Yellow magnesian limestone with carbonaceous stains	3

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Total 22 feet.

At Welsea quarry near Well this upper system of beds is 30 feet in thickness. The lime burnt from it may be spread over the land at the rate of six chaldrons to an acre, whilst of the true magnesian limestone two chaldrons to an acre are about as much as the soil can usually bear with advantage. In Ripon park are beds of gypsum which probably belong to the red and white marls which are placed above as the top stratum of the series.

*The Triassic or Saliferous system. The New Red Sandstone series.* From the line drawn from Pierse Bridge on the Tees, through Catterick Bridge on the Swale to Tanfield on the Yore, and Thorp Arch on the Wharfe which forms the boundary on the east of all the Palæozoic deposits of North Yorkshire beneath a tract of comparatively level country which measures in breadth twelve miles at the narrowest part, and comprises altogether an area of 500 square miles, stretch the deposits of the New Red Sandstone series. This is, in fact, the northern portion of that long line of valley which is continued through the southern part of Yorkshire and which extends as far south as the neighbourhood of Nottingham and there expands into the great New Red Sandstone plain of the Midland Counties.

In North Yorkshire these Triassic deposits are so thickly overlaid with diluvial sediment that it is only in a very few places that they are exposed to view, and we can only form a somewhat vague idea of their character and thickness. In the salt producing district of Cheshire, the series is 1700 feet thick, and in the valley of Severn it is about 300 feet less. The lower part of it consists principally of thick sandstones, which are usually coarse in grain and by the agency of per-oxide of iron deeply tinged with red. In Nottinghamshire this portion of the formation has an average breadth of from eight to ten miles, the soil which rests upon it being chiefly composed of light yellowish sand, but all deep sections of undisturbed beds are red. In Cheshire this part of the series has a total thickness of 1000 feet, the beds being conglomeritic below and more lami-

nated and more interpolated with clays as we proceed upward. In our own field of study these sandstone beds may be seen in quarries at Ripon and Boroughbridge, and in the bed of the Tees about Croft. In two or three places in the vicinity of the Tees they have been partially sunk through in fruitless attempts at boring for coal. At Dinsdale they were excavated to a depth of 450 feet, and opposite Sockburn to a depth of 700 feet without the Magnesian Limestone being reached. Here the strata were found\* to consist of white, grey or reddish sandstones, with occasional partings of a more compact nature, red or blue shale, carbonaceous matter in thick layers and gypsum in nodules or beds. In one case a bed of gypsum was found which was three feet in thickness. In sinking for the foundations of the bridge over the Swale, of the Leeds Northern railway, solid sandstone was reached on the west of the river but not on the east. The upper part of the series consists principally of red marlstones which in Cheshire are 700 feet in thickness, and in North Yorkshire may be seen in the Howardian district and about the Tees estuary. These are the beds which yield Rock Salt and the most plentiful supply of gypsum. In Nottinghamshire they form the subsoil of the claylands of the eastern part of the country, their escarpment being visible in a well defined chain of low hills which crosses the great north road above Markham Moor. The beds sink gradually beneath the diluvial sediment of the great plain which is drained by the Trent.

*The Oolitic system. The Lias series.* For the typical section and for the greatest thickness of the Lias formation we must go to Cleveland, where it forms the lower part of all the moorland escarpments, and of most of the coast cliffs. Here we have it with strata as under, beginning from above.

1st. *The upper lias clay or shale*, about 200 feet in thickness, the upper part a soft shale from which Alum is manufactured, the lower part firmer and harder, with bands of ferruginous and argillo-calcareous nodules, and a band containing jet.

2nd. *The Ironstone and Marlstone beds*, about 150 feet in thickness, consisting of highly arenaceous shales and laminated calcareous sandstones, succeeded above by several bands of nodular and stratified ironstone, which are worked extensively.

3rd. *The lower lias beds*, from 300 to 600 feet in thickness, a nearly uniform mass of tolerably firm shale, with many layers of nodular ironstone, and in some inland localities, laminated limestones at the bottom.

\* The complete sections as reported by the miners engaged in these excavations are given by the late Mr. Winch, in the fourth volume of the Transactions of the Geological Society.

The greater part of the series may be best examined in the coast cliffs. It first makes its appearance from under the sandstones of the Inferior Oolite at Blea Wyke\*, nine miles north of Scarborough. From this point it rises gradually to the steep cliffs on the south side of Robin Hood's Bay, where it reaches 270 feet above high water mark. Here it is thrown up on the north by a dislocation so considerable that 300 feet of the lower shale is exposed, with 40 feet of the ironstone and marlstone series above it and the whole thickness of the upper shale. From this point to Baytown the beds range nearly level, but on the north they dip so rapidly that within little more than a mile of the village the lower shale again sinks beneath the surface and in a mile more the ironstone series does the same. Opposite Hawsker only a small portion of the upper shale is seen at the base of the cliffs. Towards the cliff upon which Whitby Abbey stands it rises slightly, but north of the Esk as far as Sandsend the whole series is depressed beneath the surface by dislocations, and for three miles the coast is guarded by banks of clayey diluvium piled upon a floor composed of the sandstones of the Inferior Oolite.

At Sandsend we have the cliffs again with the upper shale 150 feet thick. At the Kettleness Alum Works the softer portion of the upper shale is 150 feet in thickness, the firm lower nodular band 30 feet, a band of soft shale beneath it 20 feet thick and at the base 20 feet of firm shale, and the upper ironstone beds form projecting scars. Along the line of the Runswick stream a fault of about 40 feet elevates the beds on the north. For some distance beyond Runswick the firm lower band of the upper shale forms the base of the cliffs but as we approach Staithes it rises and the Ironstone beds again appear. Not far from Staithes there is an oblique dislocation of 15 feet, depressing the beds towards the north. Along the line of the Staithes stream is a third and larger dislocation, with an effect of about 150 feet, which lifts to the top of the cliff on the north side of the harbour lower members of the Ironstone set of beds than are to be seen above the surface of the ground on the south side of it. In the magnificent cliffs of Boulby, which are 660 feet in height, we have a beautiful section of the series, including all its members from the top bed downward to a depth of 100 feet in the lower shale. From this point this lower bed sinks almost to the sea level across Skinningrove Bay, rising again in Huntcliffe to 180 feet and sinking to 50 feet at the termination of the cliff at Saltburn; and its beds form the ranges of rock which

\* Wyke, as used as a termination or separate word in North Yorkshire topography, often means a small bay. In its more usual acceptation it is synonymous with the Latin *vicius*, as in Norwich, Berwick.

from the sandy beach at Redcar extend for about a quarter of a mile into the sea.

From this point the series spreads inland to form the floor of Eston Nab and its upper boundary is continued along the edge of the hills by way of Upleatham, Highcliff, Roseberry Topping, Leven head, Burton head, and the northern edge of the escarpment of the great moorland mass. In Roseberry Topping it attains 1000 feet, the average rate of dip north east towards Boulby being 46 feet per mile and due north to Eston Nab 80 feet per mile. Its upper limit is usually marked with great distinctness beneath the oolitic sandstones, which everywhere cover it on the higher levels, but as we proceed towards the west, the upper band becomes more arenaceous in character as compared with the coast sections and can be no longer worked profitably for Alum. Opposite Stokesley the series attains its maximum elevation of 1200 feet. The Esk runs down a synclinal fold or trough of the lias and both in the main dale and along all its tributary streams the liassic beds are everywhere exposed by denudation of the sandstone of the moor tops. From the Stokesley tract due east to the High Peak, its average dip is at the rate of 43 feet per mile, and in the direction of Whitby, east by north, it is 55 per mile. In the dales of the great moorland mass from Snailesworth eastward by way of Bilsdale, Brandsdale, Farndale, Rosedale and Newtondale, it is also exposed by denudation, thickest in their upper parts and descending gradually along their edges as we pass from north to south. Beyond the western flank of the hill country, where the escarpment turns due south, it extends in an undulated slope which is generally about four miles in breadth, the outer edge of which reaches as far west as the Cod Beck at Thirsk and the Swale at Topcliffe. In the Vale of Mowbray the Ironstone and Marlstone band is just traceable and the upper shale is best seen in Cotcliffe wood and on the banks of the stream below Osmotherley. A narrow band of liassic beds still continues through the low country from Topcliffe in the direction of Easingwold and Sheriff Hutton. At Brandsby, 19 miles south of the point of its maximum elevation, the surface of the Lias is 280 feet above the sea level, which gives an average declination in this direction of about 50 feet per mile. From this point it forms the lower part of the slope of the Howardian hills towards the south as far east as the Derwent.

*The Inferior or Bath Oolite series.* The beds of the Lower Oolite, as shewn in the coast sections, are as follows, beginning with the uppermost, viz.

1. *The Cornbrash*, a thin fissile, partially oolitic limestone, 5 to 10 feet in thickness, remarkably filled with fossils.

2. *The Upper Sandstone and Shale beds*, about 200 feet in thickness, consisting of irregular beds of thick sandstone, with layers of shale and bands of ironstone nodules inter-stratified amongst them, and enclosing also one or two thin coal seams.

3. *Shelly, somewhat oolitic limestone beds*, much intermixed with clays, sand and ironstone, in thickness varying from 30 to 60 feet.

4. *The Lower Sandstone and Shale beds*, about 500 feet in thickness, enclosing ironstones and two distinct, although irregular, layers of coal.

5. *The Dogger beds*, from 10 to 70 feet in thickness, consisting of irregularly developed subcalcareous sandstones, much mixed with iron, with bands of shells and plants. This bed in some places passes by a gradual transition into the Upper Lias shale beneath it.

The Cornbrash is first seen to emerge from beneath the strata of the Middle Oolite between Filey and Scarborough. In Gristhorp cliff, which attains 295 feet above high water mark, we have the Cornbrash and 50 feet of the upper sandstones. The strata rise towards the north and in the lower beds of sandstone here many fossil plants have been found.\* In an island opposite Redcliff the third or calcareous bed is just seen at low water, but by a fault on the north side of it the beds are depressed about 140 feet and by a landslip in Cayton Bay the strata of this series are hidden altogether.

Immediately beyond the bay we have the Upper Sandstones again rising towards the north, and at Ewe Nab the calcareous bed rises above high water mark, to disappear in the cliffs round Cornelian Bay but to reappear at the White Nab. From this point to Scarborough the Upper Sandstones form the great mass of the cliff, capped in one place by the Cornbrash, and the lowest stratum of the Middle Oolite, whilst a considerable surface of the calcareous bed is exposed at low water. At the Castle Hill the beds of this series are altogether depressed beneath the surface, but as we pass towards the north they rise again, and soon the Cornbrash terminates, and for some distance the Upper Sandstones, with a mass of

\* Professor Williamson refers these plant-bearing beds to the third set of strata, of which he gives the following sections, viz:—

*Cloughton Wyke and the White Nab.*

	feet
Layers of nodular ironstone and argillaceous oolite .....	3
Clay .....	1
Nodular iron (the megalosaurus seam) ½ to 1	
Hard blue clay, often much tinged with iron .....	2
Hard blue fine grained oolite sometimes ironshot .....	6
Hard blue limestone .....	14 to 20

*South end of Cayton Bay.*

	feet
Soft beds of argillaceous oolite .....	3
Sandstone and carbonaceous shales .....	9
Sandstone .....	1
Tenacious blue shale, the lower part carbonaceous (the plant bed.) .....	4
Impure coal .....	½
Alternating sandstones, ironstones and shales .....	25
Iron nodules .....	1
Hard granular bed, much ironshot .....	8

diluvium over them, make up the whole of the cliff, which here is under 200 feet in altitude. At Cloughton Wyke we have on the top of the cliff thick beds of block sandstone belonging to the lower part of the Upper Sandstones, beneath it a considerable thickness of shale with ironstone balls, then 6 feet of nodular shaly limestone full of shells,  $1\frac{1}{2}$  feet of shale, again a bed of nodular shaly limestone full of shells,  $2\frac{1}{2}$  feet of shale, then soft calcareous layers with shells and lowest of all the solid subcalcareous sandstone of the third set of beds, with a few fossils and accompanied by ironstone and calcareous shale. The strata still continue to rise towards the north and soon the Lower Sandstone and Shale beds make their appearance, with a coal seam about a foot in thickness. At Hayburn Wyke there are considerable marks of dislocation. From this point to the High Peak the cliffs rise in altitude from 296 to 585 feet above high water mark. In this long line of magnificent precipices we have very nearly the whole of this series of strata exposed so as to allow of ready examination, for although opposite Staintondale a landslip hides the lower part, yet by combining what is seen on the north and south of it we obtain an excellent section as follows, viz:—

1. The Upper Sandstone: carbonaceous gritstone, with black shales and carbonised wood. This is 40 feet in thickness and is quarried at the edge of the cliff.

2. Shelly Limestone with shale, 30 feet.

3. The Lower Sandstone and Shale beds: 130 feet of sandstone and shale beds in numerous alternations, with fossil plants and traces of coal: 60 feet of thick sandstone: 200 feet of thin sandstones and thick shales in numerous alternations, with fossil plants: 20 feet of white gritstone, 10 of shale, 20 of gritstone, with ironstone and fossil plants, 10 of shale. The total thickness of this set of beds is 450 feet.

4. The Dogger beds (best seen at Blea Wyke.) 30 feet firm grained yellow irony sandstone with layers of pebbles and numerous shells; 20 feet softer sandstone with irony masses of shells [and 20 feet argillaceous fissile sandstone, also with shells, which forms a transition to the Upper Lias Shale.

These thick Lower Sandstone and Shale beds form the cap rock of most of the Cleveland hills and in most places as far as their termination at Saltburn cover the Lias in the coast cliffs. This set of beds may be seen inland forming scars at Arncliffe woods near Egton Bridge, Danby Crag, Huntcliffe, Roseberry Topping, Wainstones, in Bilsdale, Newtondale and many other localities. North of the Esk it attains an elevation of 988

feet in Danby Beacon, and 1057 feet in Roseberry Topping. The same shells that are found in the Dogger beds at the Peak are met with inland in Goathland dale and in the escarpment of the Cleveland hills opposite Stokesley. The coal seam of the Lower Sandstone, which is shewn on the coast north of Cloughton Wyke, is known and sometimes worked in most of the southern dales of the Esk district. The calcareous beds which intervene between the two thick masses of Upper and Lower Sandstone cannot be traced very distinctly amongst the moorlands, but they are known in some of the southern dales of the Esk and also in Comondale and Scugdale. This Lower Oolite series forms the higher levels of all the moorland mass along the line of watershed between the Esk, the Leven, and the Derwent, the culminating points of which attain an elevation of 1000 feet in Lilhow Cross, 1400 feet in Loosehoe Moor, 1485 feet in Burton Head and 1427 feet in Dromanby Bank. This summit of drainage is in fact the line of an anticlinal axis of these strata, which runs east and west and from which they dip towards the north and south. Where the beds of this series sink beneath the tabular hills of the Middle Oolite, these latter rise above them in a conspicuous escarpment, so that the line from Hambleton End to Scarbro' which marks the disappearance of this series from the upper levels is easily traceable. On the western flank of the moorlands opposite Thirsk we have upwards of 200 feet of Middle Oolite on the surface, and upwards of 600 feet of the Lower Oolite shewn beneath it as under, the surface of the series being about 850 feet above the sea level ;

1. A trace of the Cornbrash.
2. The Upper Sandstone and Shale beds, 250 feet in thickness, with ironstone and carbonaceous bands.
3. Calcareous oolitic and shaly beds, 30 feet thick, with iron bands.
4. The Lower Sandstone and Shale beds, 320 feet thick, with ironstones, one 3 feet bed and several bands, also with bands of cement nodules, and a coal seam.
5. Calcareous, shelly, partly oolitic ironstone, 7 to 12 feet thick, 20,000 tons to the acre, over it in some places shale with a band of ironstone nodules.

In the Howardian tract this series forms a narrow terrace which extends from the hollow along which the Thirsk and Malton Railway runs to the Derwent at Crambeck, its beds sloping towards the east and north-east. The highest part of the ridge is towards the north-west, where it attains an elevation of upwards of 500 feet. The most noteworthy feature

which the series, in this part of its course, presents is a change in the central calcareous bed, which here assumes an aspect of more decided difference than heretofore as compared with the sandstones which surround it, and becomes divided into two distinct portions, the upper band slaty and fissile, and the lower typically oolitic, the two being separated from one another by sandstone and blue clay. This is best seen in the neighbourhood of Brandsby and Terrington. There is also a cap of this series over the Lias in the hill at Craike near Easingwold and in the vale of Mowbray the south end of Cotcliffe wood.

*The Cleveland basaltic dyke.* This is a remarkable dyke of dark coloured basaltic rock, nearly vertical in position, generally about 60 feet in horizontal thickness, which although in some places not exposed at the surface may with tolerable certainty be presumed to extend continuously from Cockfield Fell in Durham across the Tees by way of Stainton and Great Ayton to Eskdale and Goathland dale and which terminates within four miles of the sea a short distance south-west of Whitby. Its total length is about 60 miles. The strata which it penetrates are, in Durham the Mountain Limestone, the Millstone Grit and the Coal Measures; in North Yorkshire the New Red Sandstone, the Lias and the Lower Oolite. By some geologists it is supposed to be connected with the Teesdale Whin-Sill, but although it is quite possible that it may owe its origin to the same centre of igneous disturbance it is quite evident that the Cleveland dyke is much later in the date of its protrusion than the Teesdale mass. Generally its sides are not quite perpendicular and the beds on the north of it are somewhat depressed. In some places a tendency towards the prismatic type of structure is observable in its masses. In the neighbourhood of the Tees it is quite overlaid by the glacial diluvium. In the Ayton tract it forms a conspicuous ridge and at Langbargh and in Kildale it is extensively quarried for roadstone. From this last mentioned dale its course lies along the dale of the Esk for some distance in a line not from the river. At Egton Bridge it forms a steep scar in Limber hill, on the south side of the Esk and from thence turns south-east to the head of Iburndale, and at last, after becoming considerably reduced in thickness it is lost amongst the thick sandstones of the moorland mass not far from the point where the main branch of the Derwent takes its rise.

*The Middle or Oxford Oolite series.* The beds of this series form the upper levels of the range of tabular hills which is situated on the south of the moorlands of the Lower Oolite. Except where it is broken through by the dales of the Derwent district this range extends continuously from



within five miles of Thirsk eastward to the sea-coast, measuring thirty-five miles from east to west. The elevation of its table land above the sea-level lessens as we proceed from west to east with remarkable regularity. Hambleton End is 1289 feet high, Easterside 1048 feet, Helmsley Moors 1078 feet, Levisham Moor 832 feet, Hackness Moor 714 feet, Olivers Mount 490 feet and Gristhorp Cliff 295 feet. Along the whole of this line the beds of this series are escarped towards the north over the Lower Oolite with considerable abruptness. From Hambleton End the range extends due south by way of Kepwick Bank (1234 feet), Boltby Bank (1075 feet), Whitstoncliff (1056 feet), and Rolston Scar (950 feet), the series being elevated along all this line of the western flank of the moorlands upon from 800 to 900 feet of Lower Oolite and Lias, its cliffs from this elevation overlooking the Vale of Mowbray with striking effect. From Rolston Scar the embankment, still a steep one, turns due east by way of Oldstead Bank and Wass Bank to Oswaldkirk and Stonegrave, and from this point, as well as along the south of the main portion of the range, its beds slope gradually towards the east and south till they are lost beneath the Vale of Pickering.

The general section of the series may be stated as under, beginning with the beds from above, viz :

1. Upper calcareous gritstone, 60 feet.
2. Oolitic limestone, with abundant remains of corals, 60 feet.
3. Lower calcareous gritstone, 100 feet.
4. The Oxford Clay, a soft grey argillaceous stratum, 150 feet.
5. The Kelloways bed, a firm ferruginous or argillaceous sandstone, 40 feet in thickness.

In the coast cliffs the upper calcareous gritstone is not anywhere seen. The first appearance of the beds of this series as we proceed from south to north is at the remarkable promontory called Filey Brig, where its firm upper beds, the lower calcareous gritstone and the lower part of the coralline oolite, form a grand natural pier and breakwater. About 25 feet below the surface of the calcareous gritstone is a more arenaceous band than the rest, which contains a number of hard siliceo-calcareous balls, and this band with its imbedded natural cannon balls is constant throughout the range of this bed and may be seen both in the Scarbro' Castle hill and the cliffs on the western flank of the range of hills near Thirsk. About a mile on the north of Filey the Oxford Clay appears; and in Gristhorp cliffs we have beneath 8 feet of diluvium, 30 feet of the lower part of the lower calcareous gritstone, 40 feet shewing a gradual transition between this and the

Oxford Clay, 120 feet of the Oxford Clay, 25 feet of the Kelloways sandstone, with 55 feet of the beds of the Lower Oolite series beneath them. At Redcliff, by the 140 feet dislocation of which we have already spoken, we have on the north the Kelloways band brought nearly down to the shore and the whole series shewn in the cliff of 285 feet as high as the lower part of the lower calcareous gritstone. By the landslip in Cayton Bay we have the Oxford Clay brought down to the shore-level, with a cliff of lower calcareous gritstone over it. Between the White Nab and Scarbro' only the Kelloways sandstone is seen, and this caps the Lower Oolite only in one particular locality. In the Castle<sup>h</sup>ill at Scarbro' we have all the beds from the Coralline Oolite, 40 feet in thickness, downwards, with a remarkable dislocation on the northern face of the hill by which a narrow band is uplifted so that the Kelloways sandstone is brought to a level with the lower part of the lower calcareous gritstone on either side of it. At the pier the Kelloways sandstone occupies the shore, but on the north of the Castle hill except in the uplifted portion, we have the Oxford Clay 135 feet in thickness. In the low cliffs on the north of Scarbro' the beds rise gradually, and before we reach Scalby the series disappears, and is not again seen.

The Upper Calcareous Gritstone covers the Coralline Oolite in various inland localities, as at Silpho Brow near Hackness, and in several places in the low ground about Kirby-moorside, Helmsley and Ampleforth. The Coralline Oolite and Lower Calcareous Gritstone form everywhere the surface and upper levels of the range of moorlands, often passing one into the other by gradual stages of transition. At the western extremity of the range we have the Calcareous Gritstone well exhibited in the conspicuous precipices of Whitstoncliff, Boltby Scar and Rolston Scar, at the first mentioned station forming a perpendicular cliff just 100 feet in depth. Here the Oxford Clay below the cliffs is considerably thinner than in the coast sections; but the Kelloways sandstone may be traced from Scarbro' along the northern escarpment of the range to the Thirsk tract with but little variation either in character or thickness.

Beside the main range of moorlands which have been described a narrow terrace of the beds of this series stretches from the Gilling hollow opposite Stonegrave eastward to the Derwent by way of Hovingham, Barton and Malton, bordering the Howardian terrace of Lower Oolite on the north, its beds sloping towards the north east till they sink into the vale of Pickering.

*The Kimmeridge Clay and Gault series.* The latest deposits of the Oolitic period which we have in Yorkshire are a series of argillaceous beds

which overlie the limestones of the Middle Oolite and which correspond partly to the Kimmeridge Clay which underlies in the South of England the Portland Limestone and partly to the Lower Cretaceous formation. On the coast of the East Riding we have, rising from beneath the Chalk at Speeton to a height of about 200 feet above the highwater mark, a series of beds of dark blue clay, which in some places are much contorted and inter-laminated with nodules of argillaceous ironstone. Within a mile of their first appearance they sink beneath the shore-level and till we reach Filey Brig the coast line is guarded by massive banks of diluvium. Judging from the fossils of these beds the upper portion of them is coeval with the Gault which in Sussex and Cambridgeshire underlies the chalk and the lower part with the Kimmeridge Clay. This lower part stretches round the edge of the beds of the Middle Oolite series to Helmsley and Kirby-moorside and in its inland course lower beds than any of these which are exposed in the coast section are seen, with thin bands of calcareous gritstone interlaminated amongst the clay and above them layers of *Ostrea delta*. The beds of this series evidently underlie the whole of the vale of Pickering, which embraces an area of 160 square miles, 'one half of which belongs to the North Riding. South of the northern edge of the vale, they are overlaid by a considerable thickness of diluvium, but they reappear in several places along the margin of the Wolds.

*Close of the Secondary period.* It is evident that during the deposition of all these Oolitic strata the sea bed on the east of the Palæozoic hills was many times upraised and depressed, for although the great mass of this wide range of deposits is of marine origin, yet in some places there are amongst the fossils which they contain evident tokens that land was sometimes elevated above the surface of the waters in the tract where and whilst these beds were in course of accumulation. In the East Riding there are marks of a considerable elevation of the surface, which must have taken place towards the close of the Oolitic era. A line of anticlinal axis runs from east to west and the beds slope from this line both towards the north and south. Upon the Oolitic strata the Chalk of the Wold hills rests unconformably in the same way that we have already seen the Magnesian Limestone resting upon the deposits of the Carboniferous system; and before the Chalk was deposited there has evidently been a considerable waste of the elevated Oolite, for in some places along the line of anticlinal axis the upper beds are altogether swept away and the Chalk is placed in juxta-position with the Lias. As we have it in Yorkshire the Chalk is entirely a marine deposit, but there is none of it within the limits of the North Riding.

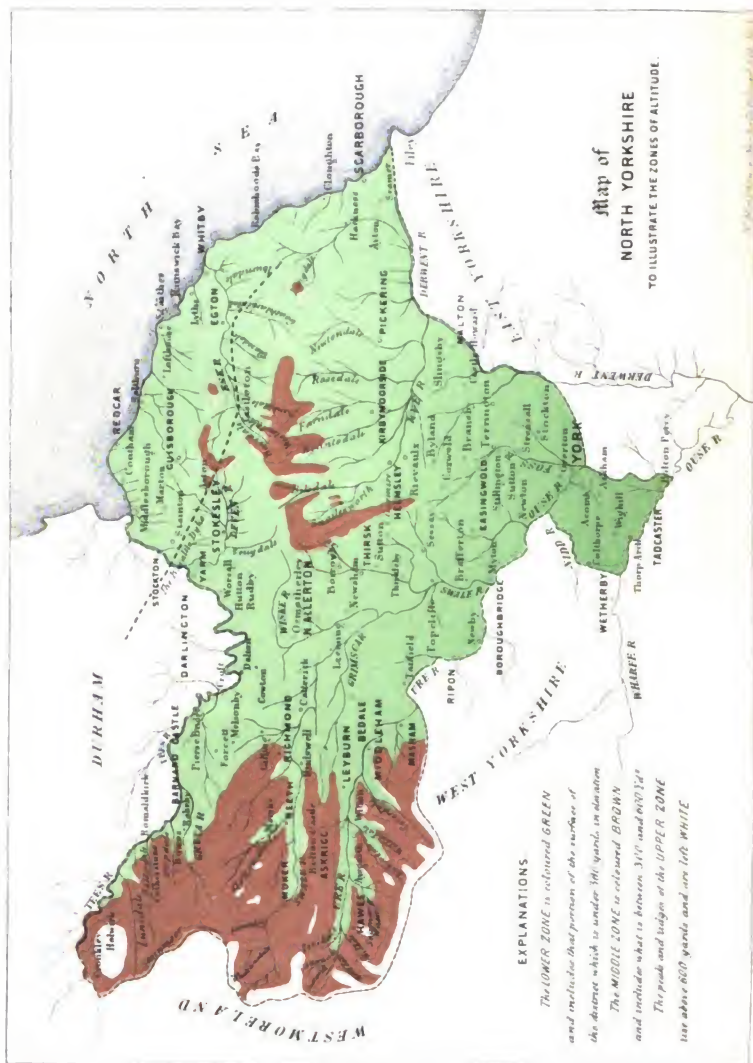
*The Tertiary period—The glacial diluvium.* For a long time during the early part of the Tertiary period we may suppose the general contour of the surface of our district to have been very much as it is now, the vale of Pickering an arm of the sea, the central valley also submerged, and on the east and west of this broad gulf a mass of elevated land rising above them in the same way that the two moorland ranges rise now. Of the beds of the Eocene system down to those of much later date we have no traces in North Yorkshire, though the shelly deposit at Bridlington seems nearly coeval with the Crag of the Eastern counties. The animal remains which belong to the close of this long period of rest have been held to indicate the prevalence of a climate much more tropical in character than our present one. The North Yorkshire Fauna of this preglacial epoch includes the Elephant, the Rhinoceros and the Hippopotamus, and the celebrated cave of Kirkdale, where most of these remains have been found and which is considered by Dr. Buckland to have been at this time a den of Hyenas, is elevated very slightly above the present sea-level. Besides these tropical species, north temperate Mammals also occur, the Megaceros, Red Deer, Ox, Urus, Wolf and Fox.

But again subsidence ensued, extending through the whole of the district and bringing with it a depression so thorough that only what are now the higher levels of the moorlands still remained exposed above the surface of the ocean. The main current of the inundation has evidently flowed from the north-west towards the south-east, for we find that large blocks of the Granite of Shap fell and other peculiar rocks of the Cumbrian Mountains have been carried by it over the Pennine ridge, which at its lowest point is elevated 1450 feet above the sea-level, and not only distributed through the central valley and borne to the foot of the Hambleton Hills and the Wolds but also carried as far as Holderness and other parts of our eastern coast-line. It is also evident that at the time of this tremendous inundation the general outline of the hills was the same as it is now, for the main current has broken over the lowest part of the ridge and swept down the Stainmoor hollow. It is now very generally supposed by geologists, that, unlike the period which immediately preceded it, the era of the inundation was a time of intense cold, that what are now the higher mountains were then islands in such a sea as we have at the present day only in the Polar regions, islands with glaciers in the hollows which radiated from their icy peaks, and that huge sailing icebergs furnished the means of transit for the larger masses of rock which have been carried to a great distance from their original or earlier places of localization. The

result of this inundation, so far as our field of study is concerned has been an extensive and long continued denudation of the upraised and softer portions of the surface and the deposition of what was thus swept away in irregular beds over the vallies. Everywhere, in the shape of confused heaps of gravel and clay and sand, this glacial diluvium covers the lower levels of the surface. On the sea-coast we have it on the cliff tops, and in some places, as for instance between Redcar and Saltburn, between Sand-send and Whitby, and about the Spa at Scarborough, a sea-bank which rises up to a height of 100 or even 200 feet above highwater mark is entirely composed of it. In the interior of the country over an area of six hundred square miles these deposits of the glacial epoch almost entirely hide from view the New Red Sandstones of the Central Valley and the Oolitic Clays of the Vale of Pickering. Often the waterworn pebbles which its masses enclose may be identified without difficulty. Sometimes they contain the contributions of far distant hills and we may see the Ammonites and Gryphites of the Lias lying side by side with the Granite of Cumberland, the Basalt of Teesdale and the Crinoidal Limestone of the Palæozoic moorlands of the west, but more usually the imbedded stones are evidently derived from adjacent strata.

After the subsidence of this inundation we have nothing further of importance to chronicle, and so with a table of thickness of the beds, as nearly as we are in a position to register it, and of the area of the surface which they cover, this chapter may be brought to a conclusion.

THE NORTH YORKSHIRE STRATA.	Their approximate thickness in feet.	Their approximate area at the surface in square miles.
1. Mountain Limestone . . . . .	say 2000 }	330
Basalt . . . . .	250 }	
2. Millstone Grit . . . . .	say 1000	930
3. Magnesian Limestone . . . . .	say 200	10
4. New Red Sandstone . . . . .	say 1000	600
5. Lias . . . . .	850 }	660
6. Lower Oolite . . . . .	800 }	
7. Middle Oolite . . . . .	400	200
8. Kimmeridge Clay and Gault . . . . .	say 300	80
		Total 2110



## CHAPTER II.

### CLIMATOLOGY.

*Zones of altitude.* \*In Watson's "Cybele Britannica" the surface of Britain is considered as divided into two what are called "Regions" of temperature; and each of these regions is subdivided into three what are called "Zones." These two regions are divided from one another by the line of possible cultivation, which may be placed at about 600 yards in the North of England and declines to from 500 to 400 yards above the sea level in the North of Scotland. That portion of the surface which is above this line is called the Arctic Region, and what is below it is called the Agrarian Region, the three zones of each being respectively named Super, Mid and Infer-arctic, Super, Mid and Inferagrarian. Divisions such as these may be employed with great advantage when we wish to indicate the broad general features of that important department of climate which is included under the head of temperature and they are exceedingly useful to help the mind to connect together those districts which under a comparatively southern degree of latitude have their temperature lowered by elevation with those tracts which have a similar temperature under a more northern position. But at the same time, we must, in using them, be careful to remember that it is broad general similarities and contrasts only which they will enable us to express and that each, by imperceptible stages of gradations, glides into those which come next to it in place.

\* For numerous data and for information respecting various points not touched upon here reference may be made to the chapter on Climate in Phillips' "Rivers, Mountains and Sea coast of Yorkshire." For a full account of the zones of altitude see Watson's *Cybele Britannica*, vols. 1 and 4. The most complete and carefully prepared statistics which we have respecting the climate of different parts of England are those contained in the Quarterly Reports of the Registrar general, the Meteorological portion of which is edited by Mr. Glaisher. From these nearly all the tables here used are taken.

The Inferagrarian zone includes the lower levels of the surface in the country south of the estuaries of the Dee and the Humber, the Midagrarian zone the lower levels of the district which extends from these as far north as the estuaries of the Tay and the Clyde, and the Superagrarian zone the lower levels of that portion of Scotland which is still unaccounted for. Above the limit of cultivation the three zones of the Arctic Region may be traced in ascending the loftier mountains of the north, a convenient line of demarcation being furnished by the upper limit of *Erica Tetralix* to bound the lowest of the three in an upward direction, and of *Calluna vulgaris* to separate the two others. Numbering these zones from one to six, beginning with the warmest, we may conveniently and at the same time, comprehensively indicate the range of temperature which we possess within the limits of our field of study, as compared with that of Britain as a whole, by saying that we have in North Yorkshire three out of these six zones, the second, the third and the fourth, that the lowest levels of the surface are not warm enough to attain the comparatively southern temperature of the Inferagrarian zone, nor its highest summits elevated enough to reach the comparatively colder temperatures of the two upper zones of the Arctic Region. These three zones then, we will adopt, and as there is no need to use long words where short ones will answer the purpose equally well, we shall speak of them throughout these notes simply as the Upper, the Middle and the Lower zone, the Upper being the Inferarctic, the Middle the Superagrarian and the Lower the Midagrarian of the "Cybele."

*Mean Temperatures in the Shade.* For York we have two thoroughly reliable sets of observations, in both cases made with instruments manufactured and corrected for special researches. The observations of the late Jonathan Gray extended from 1801 to 1825, three observations being taken daily and the results reduced to mean values by the proper tables. The observations of my valued friend John Ford at York have now extended over upwards of twenty years and are still continued. These have been made with one of Mr. Cook's thermometers, duly compared with the Meteorological Society's standard, and the results obtained have been reported in Mr. Glaisher's tables since the commencement of their issue. The following table gives the result of both sets of observations and also the temperatures of Greenwich, Exeter, Leeds and Edinburgh, the latter all taken either direct or at second hand, through Mr. Lowe's tables in Morton's Cyclopaedia of Agriculture, from Mr. Glaisher's reports.



MEAN TEMPERATURES IN THE SHADE.						
	YORK. J. Gray 25 years.	YORK. J. Ford 20 years.	EDINBRO' Horsburgh 6 years.	LEEDS. H. Denny 10 years.	GREENWICH 89 years.	EXETER. Mr. Ellis 8 years.
January .....	34,8	36,6	39,7	39,8	36,1	41,3
February .....	37,3	37,1	39,7	38,4	38,3	41,0
March .....	40,7	40,2	42,6	42,2	40,9	43,7
April .....	47,6	46,1	44,6	46,6	46,8	47,8
May .....	54,6	51,6	51,6	51,4	52,6	53,1
June .....	59,2	57,3	57,6	58,5	58,1	58,3
July .....	62,0	59,7	59,8	61,5	61,4	62,2
August .....	61,1	59,1	59,6	60,8	60,7	62,2
September .....	55,7	54,2	55,4	56,1	56,4	58,3
October .....	48,2	47,9	49,6	50,2	49,9	52,7
November .....	40,9	40,2	42,7	42,6	42,4	44,3
December .....	36,0	37,2	40,4	40,4	39,0	42,4
Mean of the whole year.	48,2	47,2	48,6	49,0	48,5	50,6

January, it will be observed, is according to both the authorities for York the coldest and July the warmest month of the year, and between these termini there is a regular advance and retrogression. If we divide the year into seasons of three months each, reckoning December, January and February to be the months of winter, and for York take the mean of the two rows of figures which have been given, we shall obtain the following result.

MEAN TEMPERATURE OF THE SEASONS AND THE WHOLE YEAR.						
LOCALITY.	Year.	Winter.	Spring.	Summer.	Autumn.	Difference between Summer & Winter.
Edinburgh .....	48,6	39,9	46,2	59,0	49,2	19,1
York .....	47,7	36,4	46,6	59,8	47,9	23,4
Leeds .....	49,0	39,6	46,7	60,3	49,6	20,8
Greenwich .....	48,6	37,8	46,4	60,1	49,6	22,3
Exeter .....	50,6	41,6	48,2	60,9	51,8	19,3

The mean annual temperature of the coast of Cornwall is taken by Mr. Watson at 52, of the south coast of Devonshire at  $51\frac{1}{2}$ , of Dorsetshire and Hampshire at 51, of Sussex at  $50\frac{1}{2}$ , and of the south-east of Kent, in all these cases of the coast, at 50 degrees. The decrease in mean annual temperature along the eastern coast line of Britain amounts to only about 5 degrees of Fahrenheit's scale from south to north, that is to say, upon the average, one degree of temperature to two degrees of latitude. For slightly elevated localities in the interior of the country from London northward to Edinburgh the mean annual temperature is usually stated at from 47 to 49, 47 being about an average for the South of Scotland, 48 for the North of England and 49 for the Midland Counties, maritime stations being usually about one degree higher than inland places under the same parallels of latitude. The difference between Summer and Winter over the same tract is almost always between 20 and 24 degrees. As a general rule we may say that whilst towards the south-east of England as compared with York the annual means augment slightly and the summer temperatures more than the annual means, that towards the south-west the annual means mount still higher and especially that the winter is considerably warmer. In the interior of the country west of London the Summer is warmer, and the hiberno-æstival difference greater than at Greenwich. At Exeter we see that whilst the Summer is only one degree warmer than at York the Winter is 4 degrees warmer and the hiberno-æstival difference is under  $20^{\circ}$ . According to Mr. Abbey's observations for Bradford, extending over a period of 10 recent years, the mean annual temperature is 48.3, that of Summer 60.7 and that of Winter 36.3, which gives a hiberno-æstival difference just one degree higher than that of York. In the south-west of Cornwall the hiberno-æstival difference sinks down to 17 or 16, in Mr. Watson's East Highland province it is  $21\frac{1}{2}$  upon the average of nine stations, and for the North coast of Scotland and its outlying islands upon an average of four stations it sinks to 15.

The difference between a *continental* and an *insular* climate, and the influence which proximity to the sea exercises in reducing the hiberno-æstival difference by cutting down the extremes both of summer and winter temperature, will be best shewn by a table of parallel data to those contained in our last table for a few stations selected in different parts of the European Continent. The temperatures are given upon the authority of Henfrey's "Vegetation of Europe."

TEMPERATURES OF THE YEAR, AND OF SUMMER AND WINTER  
UPON THE EUROPEAN CONTINENT.

LOCALITY.	Mean of the year.	Summer.	Winter.	Difference between Summer and Winter.
Umea, Lapland .....	35	57	14	41
Stockholm .....	42	62	25	37
St. Petersburg .....	38½	62	16	46
Moscow .....	38½	66	11	55
Copenhagen .....	47	64	31	33
Berlin .....	47	64	31	33
Hamburgh .....	48	64	32½	31½
Warsaw .....	48	68	30	38
Paris .....	51	65	38½	26½
Vienna .....	50	68	32	36
Geneva .....	50	63	35	28
Munich .....	48	65	30½	34½
Madrid .....	59	77	43½	33½
Milan .....	55	73	36	37
Naples .....	63	75	50	25

The surface of a sea, it is well known, always becomes cooled and heated much less rapidly than the surface of the earth. The gulf stream carries across the Atlantic a current of heated water from subtropical to high northern latitudes. For Europe the north-east and the south-west are the two great contending winds, the former being the cold polar and the latter the warm equatorial current. And it is the modification which these influences combined exert in disturbing the normal relations of temperature to latitude that gives York a summer of Lapland and a winter of Northern Italy or as we should perhaps rather say, Umea the summer of York and Milan the winter of York. And we have in the climate of Britain upon a small scale the same modification exemplified that we have in the climate of Europe upon a grand scale, the south-east more continental, the south-west comparatively insular in its range of variation, and the north of England intermediate between them.

At York the North-west, the wind which blows from the highest parts of the Pennine chain, is the coldest and the other two winds which conspicuously lower the temperature are, as might be expected, the North and the North-east. The North-east is the most prevalent wind in March, and is frequent through April till July, but it would seem that before it reach-

es the vale of York its bitterness is somewhat broken by the eastern hills. The South-west for the year taken as a whole, is at once the warmest and most frequent of the winds. The West is the next highest in point of temperature and the East is high in Summer and Autumn; and these three with the South all upon the average elevate the temperature.

It is probable that the temperature of the rest of the low country throughout the Riding does not vary greatly from that of York: and that the differences which exist will be regulated by exposition and position with regard to the hill masses. No doubt the temperature of the level part of Cleveland will be lower than that of York, bounded as it is by a range of high hills on the south and open towards the north and east; and no doubt the temperature of the level country is, by the proximity of extensive tracts of moorland both upon the east and west, depressed to some extent below its proper average, and the temperature of the low part of North Yorkshire as a whole, is thus brought to be more upon an equality with the rest of the Midagrarian zone than it is with those parts of the Centre and South of England which the Inferagrarian zone comprises.

We do not possess for any maritime and elevated stations within our limits any records of temperature which come near to those of York as regards the period of time over which they have extended. During a comparatively few recent years Dr. Cooke and others have made observations under the auspices of the Meteorological Society at Scarbro'. At two stations upon the banks of the South Tyne with a difference in altitude above the sea of 1300 feet my valued friend Thomas Sopwith mounted sets of instruments in 1856. The most elevated of the two, Allenheads is near the head of a branch of the South Tyne about ten miles from the nearest point of North Yorkshire, and some of the observations made there, as well as at his lowland station, I shall here appropriate. For York the temperatures for the decade of years ending with 1860 are considerably below the average which has been already stated and so I give these, the means, the average daily maxima and the average daily minima, along with those from Scarbro' and Allenheads up to 1860, as summarised from Mr. Glaisher's tables.\*

\* For each section there is in the reports sometimes a month left blank. These blanks will almost always arise in a course of meteorological registration through absence from home of the observer or pressure of other engagements. It will be understood that in all the tables, the average is not always drawn from every month of every year indicated.

MEAN TEMPERATURES IN THE SHADE.

	YORK, 1849—60. John Ford.				SCARBRO', 1855—60. Dr. Cooke and others.				ALLENHEADS, 1856—60. T. Bewick.			
	Mean.	averag daily max.	averag daily min.	averag daily range.	Mean.	averag daily max.	averag daily min.	averag daily range.	Mean.	averag daily max.	averag daily min.	averag daily range.
Jany....	36.8	40.6	32.2	8.4	38.6	41.6	34.5	7.1	34.7	38.8	29.8	9
Feb'y....	36.8	41.2	30.4	10.8	37.5	39.9	33.5	6.4	34.9	40	30.4	9.6
March....	39.1	44.6	33	12.6	39.9	43.7	35.9	7.8	35.7	41.8	31.2	10.6
April....	43.5	52	36.9	15.1	42.2	47.3	38.3	9	38.5	46.7	34.6	12.1
May....	49.1	57.4	41.4	16.0	47.7	52.5	43.3	9.2	44.6	53.3	39.1	16.2
June....	54.5	64.4	49.1	15.3	53.3	60.7	47.9	12.8	50.6	60.8	45.3	15.5
July....	58.4	67	51.9	15.1	57.4	64.1	54.3	9.8	54.1	63.4	48.8	14.6
August....	58.1	66.4	52.1	14.3	58.3	63.6	54.4	9.2	54.4	63.3	49.7	13.6
Sept....	53.4	61.3	46.8	14.5	54.4	58.5	50.5	8	49.5	58.9	45.7	13.2
October....	45.2	53.3	41.3	12	49.4	52	45.5	6.5	45	50.8	40.2	10.6
Nov....	41	45.8	36.1	9.7	43.8	45.9	40.7	5.2	38.4	43.7	34.2	9.5
Dec....	38.3	42.2	32.7	9.5	39.6	41.6	35.6	6	36.5	41.6	31.9	9.7
Mean of whole year.	46.2	53.1	40.3	12.8	46.8	51	42.9	8.1	43.1	50.4	38.4	12.0

Scarb' and Allenheads, in the first place let us observe, are both shut out from the south-west in a way that will have the effect of depressing their temperatures below the point which they might be expected to reach under more favourable circumstances. Reckoning the decrease of temperature northward according to the formula which has been stated, 49 would be the isotherm of the North Yorkshire coast towns, but it seems likely that none of them really attain it within at least a degree. As regards average daily range our table shews York and Allenheads to be nearly upon a par throughout the year, and it shews well what a great difference there is in this respect between an inland and a maritime station, especially in the Spring months. The difference between the mean daily range at Scarbro' and York during the three months of Spring is within a fraction of six degrees.

The difference in the distribution of temperature throughout the seasons of the year between the different places is also a point which must claim our attention. Dividing the year into seasons as before and taking for each station the mean of the three months we obtain the following result.

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MEAN TEMPERATURES OF THE SEASONS AND THE YEAR.			
	YORK.	SCARBRO'	ALLENHEADS.
WINTER . . . . .	37,3	38,6	35,4
SPRING . . . . .	43,9	43,3	39,6
SUMMER . . . . .	57	56,3	53
AUTUMN . . . . .	46,6	49,2	44,3
THE YEAR . . . . .	46,2	46,8	43,1

We have here for Scarbro' a hiberno-æstival difference of only  $17\frac{1}{2}$  degrees, the reduction as compared with York, being effected by the lowering of the maritime temperature in Spring and Summer, whilst it is kept higher than at the inland station in Autumn and Winter. As compared with what it is at an inland station the warm weather is in fact postponed at the seaside. The winter temperature is warmer at the seaside than at an inland locality because the sea cuts off the excessive cold. The spring temperature is warmer at the inland station than at the seaside, because the sea absorbs heat from the air to make up for what it has given out in winter. The summer temperature is warmer at the inland station than at the seaside because the sea cuts off the excessive heat. The autumn temperature is warmer at the seaside than inland through the sea then giving out the heat it has absorbed in summer. This variation and the cutting off of the daily means are the change as regards temperature which is brought about by a maritime situation.

For a difference in level of fully 400 yards between York and Allenheads a reduction of 3 degrees of mean annual temperature is under the average mark. The balloon experiments made under the auspices of the British Association for the Advancement of Science give a diminution of one degree of Fahrenheit's scale for 276 feet. For Central Europe Humboldt gives the diminution at one degree for 267 feet. The Registers kept at Bywell during exactly the same period as those at Allenheads give the mean annual temperature of that station at 48,3, a difference of 5,2 degrees for 1300 feet, which is exactly 1 degree for 250 feet. Dr. Dalton long ago stated the diminution for the hills of the North of England at one degree for every hundred yards of elevation,

which for the air is probably not far from correct and furnishes a convenient figure for calculation. Of course the rate at which temperature decreases upwards will depend greatly upon exposition and other modifying influences. A station in a sheltered dale will be much warmer than one upon an exposed plateau at an equal elevation. Temperature will decrease more rapidly upon an isolated peak than where there is a greater mass of hill and at a more rapid rate, other things being equal, the higher we rise above the level country. The hiberno-æstival difference at Allenheads according to the preceding table is more like that of Scarbro' than that of York. The difference between Allenheads and York, which is 3,1 upon the mean of the year, sinks to 1,9 upon the average of the winter, rises to 4,3 in the Spring, continues at 4 during the Summer and sinks again to 2,2 in the Autumn, and although two sets of observations brought into comparison must of necessity yield very insufficient grounds upon which to establish general conclusions, yet one would suppose a priori and it also seems likely from other considerations, that the distribution of at any rate the dale temperatures throughout the seasons is after a manner intermediate between that of the open low inland country and the sea side, and that elevated masses of land like the sea-coast cut off the extremes of the year and postpone its warmth. And it is worthy of notice also that the difference between the average daily maxima of Allenheads and York is nearly 1 degree greater than the difference between their average daily minima.

We must take then the average temperature of the sea-side at 47 or something over, with a hiberno-æstival difference of 17 or 18: of the low inland country at  $46\frac{1}{2}$  to  $47\frac{1}{2}$  with a hiberno-æstival difference of from 20 to 23: and taking 47 as the most likely basis to calculate from estimate the temperature of the Lower zone at from 44 or 45 to 47 or  $47\frac{1}{2}$ , of the Middle zone at from 41 to 44 and of the Upper zone at from 39 to 41.

According to the observations of Mr. Abbey, made day by day during 1860 at Horton Hall near Bradford, as compared with the mean temperature of the air in the shade at a height of four feet from the ground, the mean temperature of the air in the shade at 8 feet was 1 degree, at 6 feet 0,5, at 3 feet 0,8, at 2 feet 2,1, at 1 foot 2,9, and upon the grass 4 degrees, in all these instances lower, and at one foot below the surface 1,6 higher.

*Maxima and Minima in the shade.* Under this head a table giving the highest and lowest temperatures registered in our own district and in other localities at the same time, will, I think be more satisfactory than to take them as observed at different times. For the maxima I have taken the Summer of 1849, for the minima the Winter of 1860.

MAXIMUM AND MINIMUM TEMPERATURES IN THE SHADE.			
LOCALITY.	Maximum in the month of July 1859.	Minimum on the night of Dec. 25-26, 1860.	difference between the two.
Helston .....	90	32	58
Ventnor .....	79	24	55
Greenwich .....	93	8	85
Derby .....	83	2	81
Nottingham.....	89,5	-8	97,5
Liverpool .....	82	16,2	65,8
Manchester .....	85	-3	88
Wakefield.....	90	-2	92
Leeds .....	90	6	84
Otley .....		5	
Ben Rhydding .....		8,5	
Harrogate.....		9,5	
York .....	82	-4	86
Scarbro' .....	77,4	16	61,4
Allenheads .....	79	8,3	70,7
Bywell .....	85,5	3,5	82
North Shields .....	81,4	6,8	74,6

The foregoing are all taken from the Meteorological Society's reports. The following notes of minima refer to the same night and are taken from the list which appeared in the Gardener's Chronicle; but whether here in all cases the thermometers were accurate and properly hung may fairly be doubted.

LOCALITY.	Minimum on the night of Dec. 25th, 1860.	AUTHORITY.
Mulgrave near Whitby .....	10	J. McLean
Easthorpe .....	8	G. Legard
Castle Howard.....	4	do.
Coneysthorp.....	0	do.
Kirkham .....	-2	do.
Bradford .....	-3	Mr. Abbey
Wakefield.....	-6	Mr. Bell
Doncaster.....	-8	Doncaster Gazette
Bedale .....	-11	Mr. Cox.
Thorp Perrow near Bedale.....	-12	Mr. Culverwell
Newton house near Bedale.....	-13	Mr. Turner.



The English and Welsh Counties in which upon the authority of the same list the thermometer sunk down to zero or below are Northumberland, Lancashire, Yorkshire, Cheshire, Stafford, Derbyshire, Notts., Leicestershire, Cambridge, Norfolk, Warwickshire, Suffolk, Brecknock, Hereford, Gloucester, Oxford, Berks., Bucks., Hertford and Essex. Here we see well exemplified what has already been pointed out—how that, the extremes of winter cold are cut off upon and near the coast in the south and west and how that they are most extreme in the interior of the lowland country and in the east. Ben Rhydding, Harrogate, and Otley are all somewhat elevated stations in West Yorkshire and at Allenheads the minimum does not fall so low as that of Bywell by 5 and as that of York by 12 degrees. The four stations to which Mr. Legard's observations relate are each within five miles of the others. Easthorpe stands upon the calcareous Howardian terrace at an elevation of 350 feet above the sea-level: Castle Howard and Coneysthorp both upon the arenaceous Inferior Oolite at 250 feet and 200 feet respectively, and Kirkham upon the sandstone in the immediate vicinity of the Derwent at 50 feet lower than Coneysthorp. The fall of temperature does not grow greater here as we ascend, but precisely the contrary. In Scotland the average minimum for the stations of the Meteorological Society in the low part of Aberdeenshire was 6 degrees below zero but at Braemar and Castle Newe, in the upper portion of the county, it did not sink below 8 and 10. At Edinburgh the minimum was —6, but at Wanlockhead, in Dumfriesshire, which is 1333 feet above the sea-level it was 6. We shall have to speak further about the distribution of winter minima when we come to treat upon the topography of wild and cultivated plants.

*Mean Temperatures in the Sun and upon the ground.* The foregoing tables, it will be observed, all relate to the temperature of the air in the shade. But, especially under an unclouded sky in summer time the direct action of the solar rays exerts a powerful heating influence, so that the average daily maxima of exposed places rise much higher than those which shaded positions reach. And at night the minimum of the ground is more or less below the minimum of the air. The following tables for Bywell and Allenheads give month by month in the first column the average excess of the daily maxima in the sun above those registered in the shade, and in the second the average fall of the nightly minima on the grass below those of the air. In the third for each locality the average daily range in the shade is given, and by adding to this the other two numbers we obtain in the fourth column the extreme range of the 24

hours, that is to say the average daily difference between the lowest point to which a thermometer placed upon the ground sinks down at night and the highest point to which one that is fully exposed to the sun's rays in the day-time rises up.

EXTREME RANGE OF TEMPERATURE IN FULLY EXPOSED SITUATIONS.								
	BYWELL, 1857—60. J. Dawson.				ALLENHEADS, 1857—60. T. Bewick.			
	Excess of average daily max. in the sun over those in the shade.	Fall of average daily minima on grass below those of the air	Average daily range in shade.	Total range.	Excess of average daily max. in the sun over those in the shade.	Fall of average daily minima on grass below those of the air.	Average daily range in shade.	Total range.
January.	3.0	6.1	10.9	20	3.1	1.6	9.0	13.7
February	7.8	7.2	12.3	27.3	7.1	2.3	9.6	19
March ...	13.6	6.1	12.7	32.4	15.1	1.6	10.6	27.3
April.....	17.3	7.2	13.8	38.3	20.4	3.6	12.1	36.1
May .....	23.1	7.3	15.5	45.9	30.4	3.5	16.2	50.1
June .....	21.7	7.3	14.5	43.5	28.4	3.0	15.5	46.9
July .....	22.8	8.6	14.4	45.8	24.7	5.3	14.6	44.6
August...	20.9	9.1	14.4	44.4	25.1	4.9	13.6	43.6
Septembr	17.1	9.7	14.4	41.2	21.7	6.4	13.2	41.3
October..	6.5	7.2	12.5	26.2	15	3.5	10.6	29.1
Novembr	4.3	6.6	12.9	23.8	6.7	2.9	9.5	19.1
Decembr	5.3	6.4	12	23.8	0.6	1.9	9.7	12.2
	13.6	7.4	13.4	34.4	16.6	3.4	12	32
Winter...	5.4	6.6	11.7	23.7	3.6	1.9	9.4	15
Spring ...	18.0	6.9	14.0	38.9	22.0	2.9	13.0	37.9
Summer	21.8	8.3	14.4	44.6	26.1	4.4	14.6	45
Autumn	9.3	7.8	13.3	30.4	14.5	4.3	11.0	29.8

Here we see illustrated the immense power which the direct action of the sun exercises, a circumstance which, as Humboldt long ago remarked, it is very necessary that we should always remember to take into account when questions connected with temperature are under consideration. Comparing one station with the other we see that it is amongst the hills, where the air is thinner and lighter than in the low country, that the direct action of the sun produces the greatest effect; but then to counter-balance this, the cooling process also goes on there with the greatest rapidity. The average daily range of temperature in the shade is not conspicuously different at the two stations at any period of the year, but the fall upon the ground at night below the minimum of the air is notably the least throughout the year at the upland station, especially in

Winter and Spring. In fact, upon the average of the year the absolute minimum upon the grass is only lower at Allenheads than it is at Bywell by a fraction of a degree.

*Area in North Yorkshire of the three zones of altitude.* Recurring to our three zones of altitude we must next seek to ascertain what portions of the surface they respectively embrace and what are their characteristic features. The most suitable lines of limit would appear to be the contour lines which mark an elevation of 300 and 600 yards above the sea-level, that portion of the surface which is below 300 yards in elevation being considered as embraced in the Lower zone, the moorlands and upper part of the dales which range in height between 300 and 600 yards making up the Middle zone, and the summits of the peaks which rise above 600 yards the Upper zone.

On the west the line of an elevation of 300 yards runs from the Tees at Winch Bridge within a short distance of the river as far as the Lune, up the Lune a little, round the edge of the fells above Romaldkirk, ascends Balderdale for a considerable distance, and thence is continued along the edge of Lartington Moor past nearly the head of Deepdale to the Greta near Bowes. From Bowes it curves considerably to the east to skirt the western bank of the dale of Gilling above Dalton and Kirby Ravensworth, and then turns to the west round Richmond Beacon to near the Swale at Applegarth, curving round the lower part of the dale of Marske and again coming sharply down to the Swale in the angle between the main dale and Arkendale. It ascends Arkendale to the foot of Shaw Beck, runs down the west side not far from the Arkle to Reeth Moor and from this point passes due westward not far from the Swale to Muker. South of the Swale it does not leave the river far as we proceed eastward from Muker to Downholme, and from thence it sweeps round the edge of Downholme Moor, Bellerby Moor and Leyburn Moor, runs along within a short distance of the Yore as far west as Thwaite Bridge above Hawes, and there turning again towards the east passes Gale and beneath Bear's head, ascends Seamerdale to above the upper end of the lake, ascends Bishopdale Waldendale and Coverdale to within a short distance of their head-passes, coming out boldly towards the Yore round the edge of the ridges which separate them, and within a few miles of Masham it sweeps round Middleham Moor and the Colsterdale hills to the Riding boundary. From this line to the western margin of the county all the surface is upwards of 300 yards in height.

Of the arenaceous oolitic hills of the east the Middle zone includes a

narrow ridge above Osmotherley and the summits of Ingleby Bank and Swainby Bank just reach it. On the north its boundary from Osmotherley Moor curves past the head of Scugdale to Faceby Bank and Carlton Bank and from thence runs down the edge of Bilsdale for some distance and curves round the head of Snailesworth to Osmotherley Moor again. Between the forks of Bilsdale it includes the peaks and from Burton Head embraces the ridge of watershed as far to the east as Rosedale and Fryupdale, with lateral ridges stretching out for some distance between the dales which open out towards the south. East of this principal area the peak of Lilla Cross just reaches it and the same may be said of Kildale Moor on the north: but of the wide extent of undulated country north of the Esk only the two peaks of Roseberry Topping and Danby Beacon and the ridge of Guisbro' Moor are high enough to reach unto it.

Of the tabular calcareous hills of the east the Middle zone includes the plateau from Black Hambleton southward by way of Kepwick Bank and Boltby Bank to Whitstoncliff and Rolston Scar, with a width at the north end of the ridge of fully two miles and extending eastward almost as far as the Rye. But towards the south the ridge which reaches into it becomes narrower and opposite Whitstoncliff is not more than a mile wide, and east of this Hambleton plateau only just the summits of Hawnby Hill and Easterside attain it.

Many of the western peaks reach into the Upper zone but nowhere does it include a continuous area of even moderate extent. Between the Tees and the Lune it can claim the ridge from Cronkley fell westward. Between Arkendale and Swaledale Water Crag, Rogan's Seat and Pin Seat reach it. Round the head of the Swale a crescent ridge rises into it which extends from Raven's Seat moor round the head of Whitstondale and Swaledale to Ladies Pillar, six principal peaks connected together by a narrow neck of elevated land. Between Swaledale and Wensleydale it includes the summits of Yore head, Shunnor fell and Lovely Seat, with a spur from this last towards the east. West of Widdale it includes a ridge about three miles in length and at the head of the dale Woe fell just reaches it. South of Wensleydale it embraces a long narrow ridge from the head of Widdale eastward to the head of Bishopdale, with lateral spurs between each of the dales towards the north and a northern outlier in Bears' head. And lastly it includes a ridge between Coverdale and Colsterdale, of which Buckden pike and Great Whernside are the peaks, with a northern outlier which stands boldly out towards the main dale in Penhill.

Probably we shall not be far wrong if we estimate that the Upper zone includes altogether some 20 square miles or about one per cent of the whole surface of North Yorkshire: the Middle zone about one fourth or one fifth of it: and the Lower zone the remaining portion or about three fourths of the whole.

*Characteristics of the zones of altitude.* There is a scar of the Main Limestone upon the western edge of Micklefell at an elevation of from 750 to 800 yards above the sea-level, and upon its summit ridge at an elevation of 800 yards and upwards a number of rocky "swallow holes" in the recesses of which grow a few ferns and other shade or damp loving plants. There is a sort of limestone pavement like that of Craven, but upon a much less extensive scale, which rises into the Upper zone upon Widdale fell and Cam fell, and this is also the case with one or two prominent "edges" of gritstone in the tract of the great synclinal depression of the Carboniferous beds. With these exceptions the surface of the Upper zone consists entirely of the swells of the highest undulations of the moorlands, sometimes grassy, but more often a combination of heath and turfy swamp.

The main dales of the west usually terminate at about 400 yards, the slope at their upper part from 400 to 550 or 600 yards being generally abrupt, but of course the mere water-channels run down from the fell tops. The summit of the Stainmoor pass is under 500 yards in elevation: that which leads out of the head of Swaledale is a little over 550 yards and that between Arkendale and Gretadale is about 500 yards. At the head of Wensleydale the passes are lower: that which leads into Garsdale is only 350 yards in height: that which leads into the dale of the Eden is a trifle over 400 yards: and that which leads out of Widdale into Dentdale and Ribblesdale is a little under 450 yards. Towards the south they are loftier: the summit of the road to Langstrothdale from Bishopdale is 500 yards in elevation and that from Coverdale is nearly 50 yards higher still, whilst between Swaledale and Wensleydale the Buttertubs pass almost reaches the boundary of the Upper zone. Of the passes between opposite dales of different drainage systems amongst the eastern moorlands only a few reach the Middle zone, that between Scugdale and Snailsworth, those which cross the Hambleton plateau and those of the highest part of the ridge of watershed between Esk and Derwent, the rest being all under 300 yards.

Throughout both the two lower zones cliffs and rocky banks are frequent amongst all the hilly tracts and their slopes and along the line of the sea-coast. Even in the Lower zone there is a wide extent of unculti-

vated heatherland both upon the east and west of the central valley; and of course this is the case to a much greater extent in the Middle zone. Small tracts of uncultivated heath descend in some places to the lower levels of the central valley, but these are growing gradually smaller and fewer, and now fully one third of its area is occupied by arable land. The royal forest of Galtres, which extended from York to the Howardian hills and from the Derwent to the Ouse was disforested in the reign of Charles the second, but several what are called "carrs," boggy pieces of ground more or less overgrown with trees and brushwood, still remain in the central valley undrained. The main body of the most elevated towns of the three western dales, Middleton, Muker and Hawes, is in each case at 300 yards or somewhat under. The only village which I remember that attains 350 yards is Keld in Swaledale. In Cleveland I do not know of any house so high as 300 yards. There is an inn upon the Hambleton plateau considerably above 350 yards and numerous scattered farm-houses at 400 and up to 450 yards in all the three dales of the west. In Greta-dale the "Spital" at the summit of the Stainmoor pass is 1450 feet above the sea level, in Swaledale Crook Seat and two or three other farmhouses attain or exceed 500 yards, and there is an inn and two other houses near the Tanhill coalpit at 1600 feet. There is a shooting box upon Askrigg moor at 550 yards and another upon the edge of the eastward spur of Lovely Seat not much under 600 yards, but above this I have not noticed anything but mere temporary sheltering places for shepherds and miners.

Though trees are tolerably abundant in most parts of the vallies\* both in hedgerows and in woods yet except in some of the carrs and occasionally by the streamsides we cannot safely regard them as indigenous in such situations. Woods are much more plentiful in the dales and amongst the lower levels of the slopes than in the low country apart from the hills and both by the streamsides and amongst the banks and cliffs of the eastern and western ranges of moorland they are in many cases evidently of aboriginal growth. Amongst the calcareous scars of the west and upon the steep banks of the dales of the calcareous hills of the east are the thickest and most extensive aboriginal woods which we possess. Respecting the altitudinal range of the indigenous trees details will be given afterwards. The Juniper and Rowan ascend the highest and just reach the upper limit of

\* Here as almost uniformly throughout these notes I use the word *vallies* and *dales* in contra-distinction to one another; meaning by the former the vale of Pickering and the vale of York; by the latter the dales of all the billy tracts.

the Middle zone. Above the Lower zone thick woods are rare and such as may be seen are often planted woods of Larch and Spruce and Scotch Fir. Of the other trees which are most usually planted the Horse-Chesnut and *Populus balsamifera* both ascend to 350 yards. There is a natural wood above Whittell Gill near Askrigg at an elevation of 500 yards and upwards and a plantation of larches on Askrigg moor at 550 yards.

The highest hawthorn hedge which I know is a little above 350 yards, and they are comparatively rare above 200 or 250 yards, the roads and fields amongst the moorlands being generally bounded by stone walls. In favourable situations in the low country the yield of Potatoes is 120 to 150 bushels per acre, of Wheat 4 to 6 quarters and exceptionally 8, of Oats 6 to 9 quarters and exceptionally 10 or even 12, and of Barley 6 to 7 quarters and exceptionally 8. *Hordeum hexastichon* is cultivated but rarely and I am not aware that *Avena strigosa* is grown at all. Rye also is but rarely grown. The other cultivated crops of the low country are Turnips, Flax, Beans, Peas, (*Pisum arvense* and *sativum*) Mangold Wurtzel, and *Brassica Napus*. Chicory is grown principally in the neighbourhood of York and a field of *Dipsacus Fullonum* is to be seen occasionally. For forage *Vicia sativa*, *Trifolium pratense*, *T. repens* and *Medicago lupulina* are principally planted, and occasionally *Trifolium incarnatum* and *Onobrychis sativa*; and of the Grasses *Lolium italicum* and a host of others. Upon the argillaceous soils of Cleveland the yield of Potatoes is from 150 to 200 bushels per acre, of Wheat 3 quarters and of Oats and Barley 4 quarters each. Wheat succeeds best in the central valley and is very little grown above 200 yards. The highest field which I remember to have seen was above Aysgarth at a little under 300 yards, and upon the Hambleton plateau above this elevation it succeeds so badly as to make it not worth growing\*. On passing up the three dales of the west very few cultivated fields are seen above Romalldkirk, Reeth and Aysgarth, the western portion of North Yorkshire being entirely a mining and grazing tract. The western dales are celebrated for their short-horned cattle, and cheeses, Cleveland for its horses. In the Middle zone altogether there is probably under 20 square miles of arable land. Upon the Hambleton plateau there are numerous fields at 350 yards and upwards, but I do not know of any

\* Dr. James Stark places the limit of the Wheat region in Scotland at the line of the Summer temperature of 56 Fahr. On the west coast of Scandinavia Wheat ascends to the 64th, Oats to the 65th, Rye to the 67th and Barley to the 70th parallels of latitude. In the South American plateaux the culture of grain ceases at a mean annual temperature of 22½ degrees above the freezing point, in Switzerland at 9 degrees above it, in North Yorkshire at 11 or 12 degrees above it, whilst in Scandinavia it is carried on where the isotherm is at the freezing point or below it.

which attain quite 400 yards. Here Oats are grown at the rate of  $4\frac{1}{2}$  to 6 quarters per acre and Barley at the rate of 4 or 5 quarters, but occasionally it happens, as was the case with some of the fields in 1860, that the grain does not ripen and the crop has to be used for fodder. Potatoes and Turnips are also cultivated in fields upon the plateau. In the western dales small patches devoted principally to Potatoes may be seen up to 400 yards.

Upon the Hambleton plateau the highest garden which I know is upon the contour line of 300 yards. Here Apples, Gooseberries and Red Currants are grown, and in the Kitchen garden Potatoes, Cabbages, Cauliflowers, Carrots, Beans, Red Beet, Onions, Parsneps and *Pisum arvense* and *sativum*. I know of only one good garden which is clearly within the Middle zone, and that is at 350 yards at Keld in Swaledale. Here are grown Apples, Cherries, Gooseberries, Raspberries, Red, White and Black Currants, Strawberries, and two species of Rhubarb, and in the Kitchen portion of it Carrots, Turnips, Peas, Beans, Potatoes, Cabbage, Cauliflower and Broccoli. The three latter cannot be kept through the Winter and the Apple and Cherry trees, though they grow vigorously, do not fruit freely. Parsley, Beet, Onions, Sage, and *Mentha viridis* are grown up to 350 yards in other places and in a small patch enclosed from the moor at Tanhill at 1600 feet, Potatoes, Common Rhubarb, Cabbages, Turnips, Parsley, Onions, Cress & *Sinapis alba* have been cultivated. The Pear is grown up to 300 yards against walls and the Plum tree up to 250 yards. The following is a complete list of all the ornamental shrubs known to me as cultivated at 350 yards or upwards.

*Cytisus Laburnum*, *Rosa rubiginosa*, *R. alba*, *R. centifolia*, *R. indica*, *Cydonia japonica*, *Fuchsia*, *Berberis ilicifolia*, *Ribes sanguineum*, *Hedera helix*, *Sambucus nigra*, *Ilex Aquifolium*, *Syringa persica*, *S. vulgaris*, *Ligustrum vulgare*, *Solanum Dulcamara*, *Lycium barbarum*, *Daphne Mezereon*, *Buxus sempervirens*.

The following horticultural data refer to the most favourably situated portions of the low country and illustrate principally the power of the heats of summer. The Apricot ripens so as to produce a fair crop once in two years. At Thirsk several trees are trained against the sides of the houses in the public streets, and in a favourable year the fruit has been sold in the market at the rate of a shilling per score. The Black cluster Vine produces eatable fruit in the open air except in unusually unfavourable years, but the Sweet Water does not succeed. The Walnut in favourable situations will ripen its fruit every other year. The Hop fruits but rarely in the open air. The Spanish Chesnut does not fully ripen its fruit



upon the tree, but usually the nuts though small are quite eatable after they have been kept for a fortnight. Figs will not unfrequently ripen in the open air against a south wall, but the trees require protection in Winter. The Peach and Nectarine are cultivated successfully; in 1860 some of the trees at Thirsk trained against a wall with a southern exposure were pronounced by the lessee of the Hampton Court gardens to have as fine fruit as his own, but these were killed by the ensuing severe winter. The Mulberry will not ripen every year as a standard but will usually do so when trained against a wall with a southern exposure. In Cleveland the Vine and Spanish Chesnut do not ripen their fruit in the open air and the Mulberry hardly ever, but the Peach, Nectarine and Apricot usually ripen their fruit against brick walls with a southern exposure.

Perhaps the best horticultural test of the power of the colds of winter is furnished by the ornamental shrubs, and here there does not seem to be any appreciable difference between the Cleveland low country and the Central valley. The following list applies to both of these tracts, and contains the names of some of the commonest shrubs which are what the gardeners call "half-hardy," that is, are liable to be cut down and destroyed by the frosts of winters which are somewhat colder than usual.

*Arbutus Unedo*, *Jasminum revolutum*, *Cistus ladaniferus*, *Buddlea globosa*, *Genista florida*, *Deutzia gracilis*, *Magnolia grandiflora*, South European fruticose *Cytisi*, *Tamarix gallica*, *T. germanica*, *Rhododendron arboreum*, *Cryptomeria japonica*, *Pinus excelsa*, *Laurus nobilis*, *Viburnum Tinus*, *Garrya elliptica*.

The minimum temperatures reached in various localities both within and beyond our limits during the severe weather of the Christmas of 1860 have already been stated. The following list applies to the North Yorkshire portion of the vale of York and is an attempt at horticultural appraisalment of this unusually severe frost as tested by its influence upon trees and shrubs.

*Killed.* Standard Asiatic Roses, Peach, Nectarine, *Araucaria*, *Deodar*, Mulberry, Ivy, Holly, Oak, *Aucuba*, *Prunus laurocerasus*, *P. lusitanica*, *Laurus nobilis*, *Viburnum Tinus*, Vine, *Quercus Ilex*, *Q. Suber*, Walnut.

*Injured.* Privet, Gorse, Broom, *Robinia Pseudacacia*, Fuchsia, Apple, Pear, *Platanus*, Medlar, Yew, Laburnum, Dog-Rose, Whitethorn.

*Uninjured.* Hazel, Ash, Birch, Beech, Lime, Alder, Poplars, Willows, Sycamore, Guelder Rose, Elm, Cherry, *Wellingtonia*, *Berberis ilicifolia*.

The summer of 1860 was unusually cold, sunless and humid, and this

no doubt had a powerful influence in determining the effect upon vegetation of the winter which ensued, so that no doubt we may for all ordinary purposes regard the foregoing as representing a maximum of injury. Often only the young wood of trees and bushes in the "killed" list was injured, but nothing has been included therein upon the faith of single or isolated cases. At Howsham one or two Beech trees and in the vale of Pickering several Ash trees were considerably injured and at Hildenley and elsewhere *Acer campestre*, and in the neighbourhood of Driffield several fine old trees of *Salix alba* and *Populus nigra* were destroyed. The damage to the latter-named species in the "injured" list was inconsiderable, but the three first were cut down to the ground in many places.

In reply to my enquiry respecting the influence of proximity to the sea upon the cultivation of ornamental trees and shrubs, especially as tested by the Christmas of 1860 my friend W. Mudd of Great Ayton writes in substance as follows. "Start from Marton and skirt the country by way of Ormesby, Eston, Lazenby, Wilton, Kirkleatham, Skelton, Lofthouse, Hinderwell, and Mulgrave Castle to Whitby, and I believe that between this line and the sea vegetation generally will be found fully two weeks in advance of the inland Cleveland country. As a general rule most trees and shrubs thrive better upon the inland than upon the seaward side of it. In the months of February, March and sometimes April the North, North-east and East winds often what we call "break" upon the edge of the hills and sweep the low country, cutting the tender shoots of trees and bushes both near the sea and in the interior. Along the line *Laurus nobilis*, *Pinus excelsa*, and *Cedrus Deodara* thrive and have stood the severe frosts but they are killed both upon the inland and seaward side of it. In dry situations at Ayton\* facing the south *Aucuba japonica* stood the frosts of 1860, but it was generally killed both inland and near the sea. *Prunus lusitanica* and *lauro-cerasus* were very slightly injured at Ayton, but at many places upon the line they were cut to the ground. The Holly was also cut to the ground upon the line, but inland Oak, Holly and Ivy were but little injured."

We see above that in sheltered places near the sea some of the half-hardy shrubs of the low inland country can be grown successfully. This is the case at Scarbro' with *Laurus nobilis* and *Jasminum revolutum*. The cutting off of winter minima in sheltered places amongst the hills is

\* Ayton is situated at the foot of the slope towards the south of the basaltic ridge, which somewhat protects it from the north.

fully borne out by horticultural data. Of the shrubs cultivated at Keld the only one which was injured in 1860 was *Cydonia japonica*. In Cleveland only the *Araucaria* and the *Deodar* were killed, and whilst most of the species mentioned in the "killed" list for the central valley were injured, those mentioned in the "injured" list were hardly harmed at all. In the lower part of Wensleydale the damage was comparatively trifling, and the same was the case upon the arenaceous Howardian terrace at Terrington and upon the south side of the dale of the Wharfe at Harewood. Upon the magnesian limestone at Knaresbro' *Cryptomeria japonica*, *Cedrus Deodara* and *Garrya elliptica* were not injured. If we make the circuit of the eastern range of moorlands we shall find almost always that where there are parks and gardens upon the hill-slope some of the half-hardy shrubs of the low country are grown successfully. This is the case in Cleveland with *Laurus nobilis*, *Pinus excelsa* and *Cedrus Deodara*, all of which stood the Christmas of 1860 in Kildale and at Ingleby Manor and Busby Hall. *Viburnum Tinus* thrives at Oswaldkirk and *Laurus nobilis* at Castle Howard much better than in the low country. At Mount St. John there is a tree of *Laurus nobilis* 15 feet in height and *Garrya elliptica* succeeds well, but neither of them thrive at Thirsk, which is from 450 to 500 feet lower. We cannot emulate at Thirsk the luxuriant *Roses* of Coxwold and Rievaulx, climbing the wall sides of the cottages and wreathing round the windows of the upper stories, and in Autumn the *Dahlias* and other tender herbaceous plants are often cut down by frosts at Thirsk before they are reached upon the hill-side. Of the wild plants killed or seriously injured by the frosts of 1860 the *Broom* ascends to 300, the *Oak* and *Furze* to 400 and the *Ivy* and *Holly* to 450 yards amongst the hills.

A note by my friend James Backhouse, Junr. respecting the effect of the same frost upon a *Deodar* at York is also worth quoting for the sake of its climatic bearing. The first two feet of the tree above the snow were quite killed; at four feet it was comparatively little injured; and at seven feet it was as fresh as it was where the snow completely protected it.

*Ascending and Descending wild plants.* By far the greater number of the wild plants which we possess are most plentiful in the low country and become less frequent and finally run out as we ascend. The flowering plants and ferns to which this does not apply, the *Descending* or *Montane* species, such as are most plentiful amongst the hills and either altogether absent from or less frequent in the vales, are 86 in number. In the following list these are arranged under three classes and are further

arranged under each class according to their lines of limitation in a *downward* direction, so far as these are known to me.

*Class A.* Species confined exclusively to the western moorlands and slopes. Total 46.

- 850 yards. *Carex rigida*  
 750 „ *Myosotis alpestris*  
 600 „ *Dryas octopetala*.  
 550 „ *Polygala austriaca*.  
 500 „ *Epilobium alsinifolium*, *Pyrola secunda*  
 400 „ *Thalictrum alpinum*, *Rubus Chamæmorus*, *Saxifraga Hirculus*,  
*Galium commutatum*, *Gentiana verna*, *Tofieldia palustris*, *Elyna caricina*, *Carex capillaris*, *Polypodium calcareum*.  
 350 „ *Draba incana*, *Saxifraga stellaris*, *S. aizoides*, *Meum atham-  
 anticum*, *Arbutus Uva-ursi*, *Poa Balfourii*.  
 300 „ *Potentilla alpestris*, *Pyrus Aria*, *Saxifraga hypnoides*, *Hieracium  
 anglicum*, *H. pallidum*, *H. iricum*, *H. prenanthoides*, *Bartsia  
 alpina*, *Melampyrum sylvaticum*.  
 250 „ *Thlaspi alpestre*, *Potentilla fruticosa*, *Equisetum umbrosum*, *E.  
 variegatum*.  
 200 „ *Hutchinsia petrea*, *Sedum villosum*, *Galium sylvestre*, *Polygo-  
 num viviparum*, *Sesleria cærulea*.  
 150 „ *Arenaria verna*, *Crepis succisæfolia*, *Hieracium corymbosum*.  
 100 „ *Ribes petraeum*, *Galium boreale*.  
 Below 100. *Thalictrum flexuosum*, *Salix phylicifolia*.

*Class B.* Species common to the moorlands and slopes of both east and west or confined exclusively to those of the east. Total 20.

- 300 yards. *Allosorus crispus*.  
 250 „ *Hieracium crocatum*.  
 200 „ *Habenaria albida*, *Carex pauciflora*, *Asplenium viride*, *Lycopo-  
 dium alpinum*.  
 150 „ *Viola lutea*, *Geranium sylvaticum*, *Cornus suecica*, *Hieracium  
 gothicum*, *Carduus heterophyllus*, *Vaccinium Vitis-idæa*, *Trientalis  
 europea*.  
 100 „ *Rubus saxatilis*, *Hieracium murorum*, *H. cæsius*, *Gnaphalium  
 dioicum*, *Melica nutans*, *Polypodium Dryopteris*.  
 Below 100. *Salix nigricans*.

*Class C.* Species which have their head-quarters amongst the slopes and moorlands, but which descend into the vallies, (all below 100 yards.) Total 20.

*Trollius europæus*, *Drosera anglica*, *Stellaria nemorum*, *Epilobium angustifolium*, *Ribes alpinum*, *Myrrhis odorata*, *Crepis paludosa*, *Vaccinium Oxycoccus*, *Pyrola rotundifolia*, *P. media*, *P. minor*, *Myosotis sylvatica*, *Primula farinosa*, *Rumex aquaticus*, *Empetrum nigrum*, *Listera cordata*, *Scirpus pauciflorus*, *Polypodium Phegopteris*, *Lycopodium selaginoides*, *L. Selago*.

For the Flowering Plants and Ferns this gives a proportion of about one twelfth to the Montane element in our flora as tested by number of species. If we include the Mosses in the calculation the proportion is doubled, and we have about 220 Montane species out of a total flora of 1300 species, as will be shewn in detail hereafter. As we ascend from the low country amongst the hills the number of species gradually diminishes, the Montane species which are added never compensating in number for the Ascending species which cease. According to my present notes respecting the vertical range of our indigenous Flowering Plants and Ferns we have out of 100 species, at the coast level and below 100 yards 86, at 200 yards 64, at 300 yards 50, at 400 yards 37, at 500 yards 27, at 600 yards 17, at 700 yards 11, and at 800 yards 7. But in considering this proportion in connection with climate we must be careful to remember that, as we have already seen, we have as we ascend step by step, not only lower temperatures, but also a more restricted area of surface and a more restricted range of situation. A large proportion of the species, as their localities beyond our limits indicate, are not prevented by causes connected with temperature from ascending to levels much higher than we anywhere possess them. This applies more especially to those which ascend into the two upper zones. The following lists contain a selection of species arranged according to their ascending limits. I have given them in leaps of 100 yards, twelve to each gradation.

**100 yards.** *Thalictrum flavum*, *Reseda lutea*, *Bryonia dioica*, *Scleranthus annuus*, *Convolvulus arvensis*, *C. sepium*, *Gentiana Pneumonanthe*, *Lycopus europæus*, *Scrophularia aquatica*, *Nepeta Cataria*, *Ballota nigra*, *Hordeum pratense*.

**200 yards.** *Reseda luteola*, *Malva rotundifolia*, *Epilobium hirsutum*, *Berberis vulgaris*, *Eupatorium cannabinum*, *Pulicaria dysenterica*, *Erythræa Centaurium*, *Solanum Dulcamara*, *Myosotis palustris*, *Linaria vulgaris*, *Salix fragilis*, *Lastrea spinulosa*.

**300 yards.** *Barbarea vulgaris*, *Cardamine amara*, *Silene inflata*, *Arenaria trinervis*, *Geranium dissectum*, *Acer campestre*, *Trifolium procumbens*, *Rubus fruticosus*, *Cornus sanguinea*, *Rumex conglomeratus*, *Glechoma hederacea*.

400 yards. *Cerastium glomeratum*, *Hypericum quadrangulum*, *Ulex europæus*, *Lotus major*, *Agrimonia Eupatoria*, *Hieracium boreale*, *Scrophularia nodosa*, *Stachys sylvatica*, *Polygonum aviculare*, *Quercus Robur*, *Carex hirta*, *Equisetum Telmateia*.

500 yards. *Orobis tuberosus*, *Prunus spinosa*, *Cratægus Oxycantha*, *Rosa spinosissima*, *R. villosa*, *Parnassia palustris*, *Lonicera Periclymenum*, *Hedera Helix*, *Fraxinus excelsior*, *Mercurialis perennis*, *Ulmus montana*, *Lolium perenne*.

600 yards. *Sagina nodosa*, *Anthyllis Vulneraria*, *Pyrus Aucuparia*, *Apargia hispida*, *Tussilago Farfara*, *Valeriana officinalis*, *Veronica Beccabunga*, *Primula vulgaris*, *Betula alba*, *Populus tremula*, *Corylus Avellana*, *Juniperus communis*, *Pteris aquilina*.

Critical plants and doubtful natives again excluded, thirty-five of the Ascending species have in Britain their north limit in North Yorkshire. Four of these are confined to the coast, *Medicago denticulata*, *Vicia bithynica*, *Hippohae rhamnoides* and *Salicornia radicans*. Six are confined to the central vale and do not pass north of the neighbourhood of York, *Viscum album*, *Carex paradoxa*, *Veronica triphyllos*, *Alopecurus bulbosus* and *Carduus pratensis*. Five more are confined to the vallies and do not pass north of the neighbourhood of Thirsk, *Carex pseudo-cyperus*, *Rumex palustris*, *R. maritimus*, *Potamogeton flabellatus* and *Polygonum mite*. Four more are confined to the vallies but pass north of Thirsk, *Teucrium Scordium*, *Nasturtium amphibium*, *Cerastium aquaticum* and *Eriophorum gracile*. Two species, *Chlora perfoliata* and *Anemone Pulsatilla* ascend to the Magnesian Limestone. Four species ascend to 50 or 100 yards in the dales, *Campanula patula*, *Epilobium roseum*, *Rumex pratensis*, *Carex axillaris*; and one, *Orobanche elatior*, to 100 yards upon the limestone. *Carex divulsa* and *Lamium Galeobdolon* ascend to 150 yards in the dales; *Galium erectum*, *Dipsacus pilosus* and *Brachypodium pinnatum* to about the same height on the limestone. *Acorus Calamus* ascends to about 200 yards on the non-calcareous, *Carex digitata* to 250 yards on the calcareous, *Festuca pseudo-myurus* and *Arenaria tenuifolia* to 300 yards on the non-calcareous slope.

*Periodic Phenomena of Vegetation.* A comparison of the times of the various periodical phenomena of vegetation as observed simultaneously in different localities may also be employed usefully in illustration of their climate. The following lists were made in the year 1856, the data for Thirsk resting on my own observation and nearly all of the others having been obtained through the help of kind correspondents resident in the localities to which they refer.

The leaf of the Oak was first noticed on the 18th of May at Mickley, and Cowesby, on the 19th at Thirsk, on the 20th at Camphill near Kirklington, on the 22nd at Helmsley, on the 24th at Great Ayton, on the 26th at Husthwaite near Easingwold, on the 28th at Richmond, on the 1st of June at Cotherstone and at Eastholme near Aysgarth, and on the 2nd at Lythe near Whitby.

The leaf of the Ash was first noticed on the 21st of May at Thirsk, on the 25th at Great Ayton, on the 26th at Eastholme, on the 28th at Mickley, on the 30th at Camphill, on the 1st of June at Cowesby and Helmsley, on the 3rd at Cotherstone and Thoraby near Aysgarth, on the 7th at Richmond and Lythe and on the 8th at Aysgarth.

The first crop of Hay was cut on the 25th of June at Aske near Richmond, on the 27th at Acomb, on the 28th at Husthwaite, on the 1st of July at Thirsk, Camphill, Great Ayton and Helmsley, on the 4th at Mickley, on the 7th at Cowesby, on the 17th at Lythe and on the 18th on the Hambleton plateau near Cold Kirby.

The first Harvest crop was cut on August 12th at Raskelf and Thirsk, on the 13th at Catterick Bridge near Richmond, on the 16th at Camphill, on the 20th at Mickley and Husthwaite, on the 23rd at Great Ayton and Helmsley, on the 30th at Cowesby, on the first of September at Lythe and on the 2nd on the Hambleton plateau near Cold Kirby. This will give us as the average of the nine principal localities behind Thirsk in round numbers.

Camphill .....	3 days.
Mickley.....	4 „
Husthwaite .....	5 „
Great Ayton .....	6 „
Richmond .....	7 „
Helmsley .....	9 „
Cowesby .....	9 „
Lythe .....	15 „
Cold Kirby .....	20 „

So much depends upon difference of soil and exposition, and in the case of the cultivated crops upon the time of sowing the seed, the sort of seed, the state of the cultivation of the land and the state of the weather at the time the crops have to be secured that results obtained in this way can only be taken as broad approximations. Nevertheless it would seem

likely that none of the figures given above are far from being a correct representation of the postponement of the time as compared with Thirsk when the hay crop and harvest are ready in an ordinary season. The part of our field of study where they are ready first seems to be what we may call the *Veronica triphyllos* tract, a surface of light sandy ground which is situated on the Acomb side of York and has something of a southern slope. Between York and Thirsk the average difference is not material; the gardeners say that at Thirsk vegetation is somewhat more liable to be harmed by spring frosts, but that they can usually compete in the York market with the early culinary vegetables grown in the open air with the neighbourhood of York but not with Doncaster and Pontefract. Between these as grown at Thirsk and in the garden at 300 yards upon the Hambleton plateau there is a difference of about a month. Lythe, though near the sea coast, is in an exposed position and the soil is argillaceous. Hovingham, with an argillaceous soil and situated upon the slope towards the north of the calcareous Howardian terrace is 10 days later than Thirsk. Between the light sandy soils over the New Red Sandstone on the west of Thirsk, and the clayey soils of the undulated liassic tract on the east of the town there is a difference of a week or ten days in favour of the former, and as we approach the foot of the hills, where the soil is still clayey, of a fortnight or three weeks. A month appears to be about a fair average of the difference between the earliest crops over a considerable tract of the Central valley and an elevation of 300 yards amongst the hills on both sides of it, that is to say an average of ten days per hundred yards. It is not unfrequent for the wandering labourers who come to Thirsk to be engaged for one month for the harvest in the low country, and when that is finished to get employment for another month upon the top of the Hambleton plateau. Especially in the west the ingathering of the crops in the hilly district is much more liable to be retarded by rain than in the low country. In the early part of the year there appears to be a retardation of from six weeks to two months in the flowering of species upon the Micklefell ridge as compared with the Central valley, and the retardation of the hay and harvest crops in the Central valley as compared with the South of England is about three weeks.

*Temperature of Springs and of the Sea.* In our climate it would seem that at a depth of 3 feet in the ground the annual range of temperature sinks to from 15 to 20 degrees, the periods of maxima and minima not differing greatly from what they are at the surface; that at 6 feet there is a range of from 10 to 15 degrees and that the times of the maxima and minima



are retarded: that at 24 feet below the surface the range is not more than  $3\frac{1}{2}$ , the periods of maxima and minima being as compared with the surface nearly reversed: and that at from 50 to 100 feet below the surface the temperature scarcely varies. According to the observations of Mr. Abbey at Horton Hall near Bradford in 1860 the temperature of ground at one foot below the surface was upon the mean of the year one degree and a half above that of the air in the shade at four feet from the ground, the difference between the means of the extreme months being less in the ground than in the air by 5.8 and the extremes of cold and heat being both cut off. The ground was lower than the air in March, May, June and July, higher during the rest of the year. Some of the deepest springs which we have in North Yorkshire do not appear to vary at all. The Cayton Bay spring, which supplies Scarbro' with water and which issues from the calcareous Oolitic cliffs at a height of 75 feet above high-water mark is stated by Dr. Cooke to be always at 49 degrees. A copious spring between Scawton and Rievaulx, the waters of which like those of the other, sink through the calcareous beds of the Middle Oolite to gush out at the surface of the Oxford Clay, I have tested at various times both in Summer and Winter and always found to be about 48 degrees. A third spring, situated under similar geological circumstances in a deep shaded ravine immediately beneath the village of Scawton I have found at 48 both in the Spring and Summer. But probably these invariable or nearly invariable springs are confined to the limestone. Of those which vary February appears to be the month of the minimum and either August or September that of the maximum temperature, the difference between the two varying mainly according to the depth below the surface from which the water comes. At Gormire a spring gushing out of a steep bank composed of the arenaceous rocks of the Lower Oolite with an eastern exposure and situated at an elevation of about 150 yards above the sea-level was tested month by month during the first half of 1857 and found to be 44, 43,  $43\frac{1}{2}$ ,  $43\frac{1}{2}$ , 48 and  $53\frac{1}{2}$ . The following table gives the march from February to September of three comparatively shallow springs situated at an elevation above the sea-level of about 50 yards which issue from clayey diluvium over lias on the east bank of Cod Beck between the Locks Bridge and the Worlds End Bridge near Thirsk, the range of variation here being probably an extreme one.

TEMPERATURE OF THREE SPRINGS NEAR THIRSK IN 1857.				
	NO. 1.	NO. 2.	NO. 3.	MEAN.
February .....	42	42	42	42
March .....	43	43,5	43,5	43,3
April .....	46	46	46	46
May .....	47	47,5	47,5	47,3
June .....	52	56	53	53,7
July .....	54	57	55	55,3
August .....	56	58	57	57
September ....	56	53	53	57,3

The following table of the temperatures of the sea is furnished by Dr. Cooke from observations made at Scarbro' during the latter part of 1853 and the early months of 1854.

TEMPERATURE OF THE SEA AT SCARBRO' 1853-4.				
MONTHS.	Number of observations.	Mean Temperature of the air.	Mean Temperature of the Sea.	Difference.
January .....	25	37,8	40,5	2,7
February .....	25	39,2	41,2	2
March .....	15	45,8	42,8	-3
April .....	4	43	42,3	-0,7
May .....	14	50	50	0
June .....	11	60	53,2	-6,8
July .....	7	63	55,8	-7,2
August .....	8	64	56,7	-7,3
September .....	7	57	55,1	-1,9
October .....	9	53	52	-1
November .....	6	46	48	2
December ....	8	38	43,5	5,5

This gives us for the sea an annual mean of 48,4. We see that here the difference between the extreme months is about the same as that of the Thirsk springs and lower than that of the monthly means of the air by about 10 degrees, the extreme cold of the Winter and the extreme heat of the Summer being both cut off, as is the case to a lesser extent with the air at the sea-side as compared with what it is at an inland station. It will be seen that the sea is conspicuously warmer than the air in Winter, conspicuously colder in Summer.

*Distribution of Humidity. The Rainfall.* The following table gives the rainfall, month by month, at Greenwich and at seven stations either actually within the limits of North Yorkshire or not far from its borders.

TABLE OF MONTHLY AND ANNUAL RAINFALL IN INCHES.

MONTHS.	GREENWICH, 45 years Mr. Glaisher.	REDCAR 1845-52, C. C. Oxley.	SCARBORO', 1855-60, Dr. Cook and others.	YORK, 1849-60, J. Ford.	RICHMOND, 1849-56, Jas. Ward.	BYWELL, 1856-60, J. Dawson.	SETTLE, 1837-55, J. Tatham.	ALLENHEADS, 1856-60, T. Bewick.
January .....	1,8	1,30	1,30	1,77	2,79	2,20	4,23	6,0
February .....	1,6	0,87	1,10	1,05	1,66	1,28	3,0	2,32
March .....	1,5	1,31	1,15	1,27	1,35	1,84	2,77	4,16
April .....	1,8	1,87	2,2	1,56	1,72	2,82	2,23	3,67
May .....	2,1	1,68	1,82	1,62	1,79	2,00	2,17	2,37
June .....	1,9	2,33	1,67	2,37	2,58	3,25	3,63	4,37
July .....	2,7	1,79	2,34	2,74	3,34	2,80	4,22	2,48
August .....	2,4	1,88	2,15	2,95	2,83	2,82	3,29	4,12
September ..	2,4	1,55	2,32	2,21	2,61	3,27	3,36	5,42
October .....	2,8	2,68	2,5	2,12	2,94	2,37	4,72	4,33
November ...	2,4	1,87	1,35	1,83	2,45	2,80	4,25	3,77
December ....	1,9	1,43	1,7	1,22	2,19	2,87	3,72	4,27
Total of the year.	25,3	20,56	21,6	22,71	28,25	30,32	41,59	47,28

It will be seen that the distribution of the fall over the different seasons of the year is very irregular. Out of the seven northern stations the least rainy month in five cases is February, in one March and in one May; the most rainy in three cases October, in two September, in one July and in one August. At Greenwich the Winter and Spring have about the same amount of rain; the Autumn has about half as much more and the Summer a little less than the Autumn. At the Northern stations the Autumn is the most rainy season of the Year in four, the Summer in three cases, but in every case Summer and Autumn taken together have more rain than falls during Winter and Spring taken together. The following table gives the number of days during which more or less rain has fallen during the twenty four hours in four of the stations upon an average of years varying in number from five to twelve.

AVERAGE NUMBER OF RAINY DAYS PER MONTH AND YEAR.				
MONTHS.	SCARBRO', 1855-60. Dr. Cooke and others.	YORK, 1849-60. Jno. Ford.	RYWELL, 1856-60. J. Dawson.	ALLENHEADS. 1851-60. T. Bewick.
January .....	11,2	13,8	17,4	25,5
February .....	8,0	10,2	12,6	20,2
March .....	8,2	9,8	15,2	22,2
April .....	9	11,9	17,7	23
May .....	7,2	10,6	11,2	19,2
June .....	8,2	12,2	19	21
July .....	9,2	11,5	18,8	22
August .....	8,7	12,6	14,7	19,7
September .....	8	11,8	18	22
October .....	13	15,9	17	23,3
November .....	8,5	14,6	18,3	20,3
December .....	11,5	11,5	18,3	23,3
Total of the year.	110,4	156,4	198,2	261,7

So that we see that both the smallest quantity of rain falls and upon the fewest days upon the east coast. In the Central vale the rainfall does not differ notably from what is usual in the eastern counties of England apart from the hills. Amongst the eastern moorlands there is doubtless an advance upon this, but to what extent I am unable to say; and as we leave the low country to penetrate the moorlands of the west both the quantity of rain and the number of days upon which it falls augment conspicuously and amongst the loftier mountains which lie near the county boundary the quantity of rain which falls is no doubt considerably higher than is represented by the highest figures which we have given. The rain-clouds which gather round the peaks frequently do not reach the dales and an excursionist from the towns at the head of the western dales often gets thoroughly wetted during a climb amongst the hills and on returning to the starting point finds that little or no rain has fallen there.

*The Mean Humidity of the Atmosphere.* By calling in the aid of the wet and dry bulb thermometer we are enabled to obtain a far more precise idea of the real humidity of the atmosphere than we can get by considering the rainfall alone. The following table gives, for four of the stations of which the rainfall has been already stated, the average humidity of the atmosphere month by month, taking saturation at 100, and in a fifth column that of Greenwich is appended.

MEAN HUMIDITY OF THE ATMOSPHERE TAKING SATURATION AT 100.

MONTHS.	GREENWICH 19 years. J. Glaisher.	BYWELL, 1856-60. J. Dawson.	YORK, 1849-60. J. Ford.	SCARBRO', 1855-60. Dr. Cooke.	ALLENHEADS 1856-60. T. Bewick.
January .....	89	87	90	91	90
February ... ..	86	87	90	88	94
March .....	82	84	89	86	90
April .....	79	83	82	88	86
May .....	76	80	78	87	82
June .....	73	82	83	84	85
July .....	76	73	83	86	76
August .....	77	78	83	88	80
September .....	81	82	89	88	88
October .....	87	85	88	90	90
November .....	89	83	87	93	90
December .....	89	86	88	92	89
Mean of the year.	82	83	86	88	88

This table shews how little there is of any definite relation between rainfall and mean atmospheric humidity. Scarbro' with its  $21\frac{1}{2}$  inches of rain is upon a par as regards dampness of air with Allenheads, where the rainfall is more than double. At Greenwich, which is the only station for which the observations extend over a considerable number of years, there is a regular increase in humidity from June to November, a regular decrease from January to June. The difference at Scarbro' between the extreme months of the year is only 9 whilst at Greenwich it is 16 and at Allenheads 18. And we see also how humid is even our low country, a circumstance no doubt to be attributed mainly to its nearness to the two ranges of hills, and a peculiarity which must exert an important influence both upon health and vegetation.

*Winds.* The following table, after Professor Phillips, gives the average number during each of the four quarters of the year of the different winds as observed at York from 1800 to 1809, the average temperature of each from 120 observations of each during each month of the year at York, at 8 A.M., and the average dampness of each as observed by the oat-beard hygrometer at Brandsby.

COMPARATIVE FREQUENCY AND TEMPERATURE OF THE DIFFERENT WINDS AT YORK AND THEIR HUMIDITY AT BRANDSBY.								
WINDS.	N	NE	E	SE	S	SW	W	NW
Temperature	45,7	46,2	48,5	47,7	48,4	50,4	49,8	45,4
Humidity	48,6	54,4	52,7	62,7	62,3	54,3	54,4	51,6
Jan.—March	9	9	9	11	12	16	14	10
Apl.—June	9	13	7	8	8	16	17	12
Jly.—Sept.	7	6	6	6	8	24	23	11
Oct.—Dec.	9	7	6	8	10	21	14	13
Total.	34	35	28	33	38	77	68	46

The following list then, will indicate their order of sequence in respect of frequency, temperature and humidity.

ORDER OF SEQUENCE OF THE DIFFERENT WINDS IN RESPECT OF		
FREQUENCY beginning with the least frequent.	TEMPERATURE beginning with the coldest.	HUMIDITY beginning with the driest.
East South-east North North-east South North-west West South-west	North-west North North-east South-east South East West South-west	North North-west East South-west West North-east South South-east

The principal anomaly or local peculiarity here is the position in the lists as regards temperature of the North-west wind and as regards humidity of the South-west and North-east; and these we must explain by remembering the position of the low country with regard to the hill-masses. The North-west wind is normally warmer than the North-east, but with us it blows from a cold mountainous region and often brings severe weather. The average temperature of the East wind is raised so high by the height which it reaches in Summer, but in Winter it is one of the coldest of the winds. The North-east is usually known as a keen dry wind, but with us it is thrown up by beating against the

eastern range of hills, and thus losing heat and density, often discharges its moisture in the shape of sleet; and the normally damp South-west on the contrary has much of its moisture absorbed by the Pennine chain before it reaches us.

The following table gives a list for an upland, a lowland and a maritime station, on an average in some cases of four and other cases of five recent years, of the number of winds during each quarter as arranged under the four principal heads, and of their average force at the different stations during the same period, this last an important datum in connection with climatic influences.

AVERAGE ANNUAL NUMBER OF THE DIFFERENT WINDS AT AN UPLAND A LOWLAND AND A MARITIME STATION AND THEIR RELATIVE FORCE.															
	SCARBRO'.					BYWELL.					ALLENHEADS.				
	N	E	S	W	force	N	E	S	W	force	N	E	S	W	force
Jan.-Mch.	21	18	29	41	3,0	22	18	19	46	1,5	19	27	36	51	2,0
Apl.-Jun.	33	46	28	28	2,6	21	43	28	32	1,3	18	38	41	38	1,7
Jly.-Sep.	24	22	24	23	2,4	18	22	18	54	1,3	22	20	19	52	1,8
Oct.-Dec.	15	14	25	33	2,5	14	15	23	40	1,2	17	17	24	33	1,5
Total of the year.	93	100	106	125	2,6	75	98	88	172	1,3	76	102	120	174	1,75

## CHAPTER III.

### LITHOLOGY.

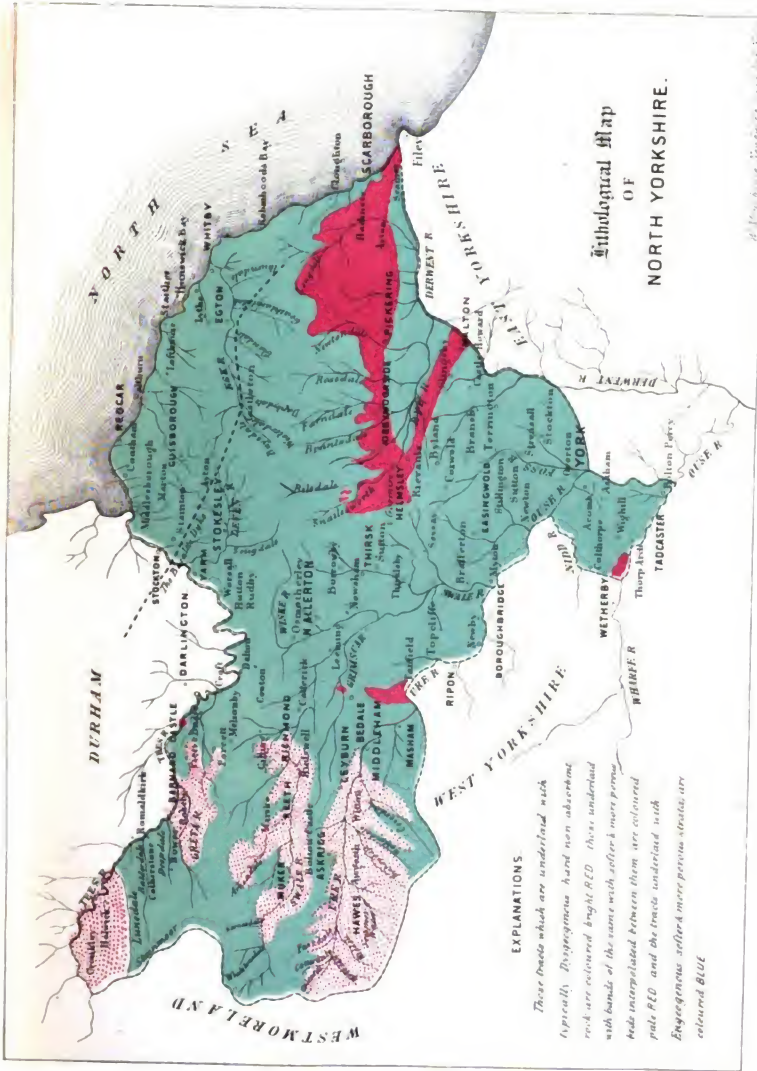
*Dysgeogenous and eugeogenous strata.* As may be gathered from what has been stated in the chapter devoted to Geology, the rocks of the different periods in North Yorkshire are, for each as a whole, characterised by well marked lithological peculiarities; and from this circumstance arises the fact that the tracts which they respectively underlie are found to possess tangibly marked physico-geographical peculiarities. To the question of the differences in mechanical constitution which the various strata present and the results which may be traced as springing from such differences as their primary cause it will therefore be needful to devote a few pages before proceeding further.

Two principal types of rock in respect of mechanical constitution may be traced. Following the nomenclature of the elaborate treatise upon this subject of M. Thurmann\* I propose to call them *eugeogenous* (plentiful-detritus-bearing) and *dysgeogenous* (sparing-detritus-yielding), these terms being better calculated than any which have been previously employed which I can call to mind to keep prominently in view what is essential to be remembered.

The essential differences between the rocks of the two kinds are mainly in respect of their hardness, their power of absorbing and retaining moisture in small masses, their permeability when we consider them as forming extensive strata, and the differences in their power of yielding detritus which result from these characteristics. If we arrange the different kinds

\* *Essai de Phytostatique applique a la chaine du Jura* par Jules Thurmann, Berne 1849, London, Williams and Norgate. See also a pamphlet of my own entitled "An attempt to classify the Flowering plants and Ferns of Britain according to their Geognostic relations."





# Geological Map OF NORTH YORKSHIRE.

## EXPLANATIONS.

Those tracts which are underlined with typically, Devonian hard non absorbent rock are coloured bright RED those underlined with bands of the same with softer more porous beds intercalated between them are coloured pale RED and the tracts underlined with Ensignian softest more porous strata are coloured BLUE

of rock in a scale according to their hardness and permeability, beginning with those which possess the smallest capacity for absorption and offer the greatest resistance to abrading influences, we shall have to place in the first rank the compact Limestones, Granites and Basalts; after them the compact Slaty rocks and Limestones like the Coralline Oolite and Calcareous Gritstone; then must follow some of the metamorphosed igneous rocks and the harder kinds of compact sandstone like the Brimham Grit and Kelloways band; then many of the Freestones, Flagstones and Chalks: and last of all and most absorbent of all are most of the rocks in which the argillaceous element is predominant, the Plates and Clays of the Carboniferous beds, the Shales and Clays of the Trias and the Lias, the Oxford Clays and Kimmeridge Clays of the Oolite. As regards permeability when bedded in extensive strata it is almost always the Limestones which are the most conspicuously traversed by fissures and breaks, and the softer argillaceous rocks which are the most compact, the sandstones and harder siliceo-aluminous beds occupying an intermediate position. The power which the different kinds of rock have of yielding detritus depends upon their position in the scale which has been indicated, and especially when they form hill masses and are permeable upon a grand scale the soils which cover the dysgeogenous rocks are comparatively dry, whilst those which cover the eugeogenous rocks are comparatively humid.

We see that difference in respect of the characteristics which have just been noticed does not by any means run precisely parallel with difference in chemical composition. Calcareous rocks are not always dysgeogenous nor arenaceous and argillaceous rocks always eugeogenous, though such is most frequently the case. We must put the Limestones of the Carboniferous, Permian and Oolitic periods upon one side and place Basalt along with them: and on the other side Clays like those of the Lias and New Red Sandstone, and Sandstones like those of the Trias, the Millstone Grit and the Lower Oolite, Chalk with the Slates and most of the Granitic rocks occupying an intermediate position. And a characteristic feature of our field of study and that which constitutes its special interest from the point of view which we are now occupying, is, that in it the strata of the different periods not only underlie well defined districts, but that they are composed either of rocks of well marked eugeogenous type or of well marked dysgeogenous type, or of bands of the two kinds mixed up together in the deposits of one period: and that, as we have already seen, rocks of intermediate lithological constitution, as occupying large tracts of surface, are entirely absent.

*Their distribution throughout North Yorkshire.* The following table then, is a repetition, except that the thickness of the beds is omitted, of that which was given at the end of the chapter on Geology, each series being refined to its proper lithological type.

LITHOLOGICAL CLASSIFICATION OF THE NORTH YORKSHIRE STRATA.		
GEOLOGY.	Approximate area in square miles.	Lithological character.
1 Mountain Limestone and Basalt	330	Subdysgeogenous
2 Millstone Grit .....	330	Eugeogenous
3 Magnesian Limestone .....	10	Dysgeogenous
4 New Red Sandstone .....	500	Eugeogenous
5 Lias and Lower Oolite .....	660	Eugeogenous
6 Middle Oolite .....	200	Dysgeogenous
7 Kimmeridge Clay .....	80	Eugeogenous

So that we have on the west bands of hard dry rock with thick eugeogenous interpolations between them forming the edges of most of the dales and ascending in some places to the loftier mountain summits, but more usually these summits and the higher surfaces of the moorlands, like their slope in the direction of the central valley, are formed of eugeogenous materials. Next follows a narrow strip of dysgeogenous and a broad area of eugeogenous lowland country, and on the east are two extensive tracts of moorland with contrasting lithological characters, both of which rise into the Middle zone, and last of all we have on the south of them a eugeogenous valley, the proportion of eugeogenous surface to that of dysgeogenous being for North Yorkshire as a whole fully three to one.

*Their influence upon the configuration of the dales and hill-masses.* The results of these lithological differences are to be found, not only in the modification which they produce upon the general contour of the surface and the influence which they exercise in determining the shape of the dales and the configuration of the hill masses, but they exercise also an influence which is by no means unimportant upon the topography of the vegetation. We will take the first question first and examine their influence upon a large scale and then treat the matter in its botanico-geographical bearings.

The different beds and bands of rock have all since the period of their original deposition been subjected to the influence of energetic watery

action. The glacial inundation must have reached a height of at least 1000 feet above the present sea-level and that is only one flood amongst many. In almost all the dales the strata upon the opposite sides of the dale correspond to each other precisely. This correspondence is disturbed by faults in Teesdale, Lunedale and Arkendale and by smaller dislocations elsewhere, but as a rule our dales are dales of denudation. In Wensleydale we have the same bands of limestone in the fells upon both sides of the hollow with an excavation between them which often reaches a mile in width and a thousand feet in depth. In the dales of the Esk and Derwent districts the sandstones of the Lower Oolite may usually be seen above the shales of the Upper Lias upon both sides at an equal elevation above the stream. And we find that the general contour of the surface and configuration of the dales and coast is very much to be explained by the fact that the strata of different degrees of hardness have been unequally worn away."

Both upon the east and in the west in the hill country two different types of scenery may be traced. The flat table lands of the limestone hills contrast conspicuously with the irregular undulations of the sandstone hills: the steep precipitous calcareous scars not less so with the irregular "edges" of freestone and gritstone. The sandstone hills are usually intersected by branching rivulets which flow from their upper levels gradually down their slopes into the low country: the limestone hills have neither streams nor natural pools upon their surfaces, but the glens slope suddenly and the water sinks through the calcareous beds to gush out in large volume when it reaches some less permeable stratum. The sandstone dales are open and irregular with gradual slopes and undulated embankments: the limestone dales are steep and narrow with sudden slopes and embankments rising up like a wall upon each side to shut them in.

It is in the east that the characteristic features of the hills of the two types are seen most readily. We have there two ranges of hills, one of which is fully 400 and the other 200 square miles in area, which throughout their extent are composed, the northern range of well marked eugeogenous and the southern mass of well marked dysgeogenous materials: and most of the main branches of the Derwent rise amongst the sandstone hills and break through the limestone range before they enter into the low country. As they pass from one range to the other the change is so striking that it cannot fail to arrest the attention of the most casual observer. The difference in outline of the two kinds of hill may be well seen by looking up Brandsdale or Farndale from the vale of Pickering. We

have then immediately in front the flat plateaux and steep narrow dales of the calcareous range with its steep escarpment towards the north sweeping far away eastward and westward, and beyond rise the irregularly undulated masses of the heathery arenaceous moors with the high anticlinal ridge to bound the horizon. In the upper part of the dales the woods are scattered irregularly over their slopes and are more frequently to be found along the margins of the streams than anywhere else, but in their lower portion the steep calcareous embankments are usually covered thickly with wood from the edge of the plateau all the way down the slope and the streamside at the bottom of the dale left free. The Bran and the Dove are both partly swallowed up by the limestone, the former in Kirkdale, the latter near Kirby-moorside, and of springs where a large volume of water flows out from the limestone we have instances at the Keld heads near Piekering, where the Costa has its source, and in the springs of invariable temperature respecting which we have spoken in the chapter on Climate.

In the main dales of the west, especially in the upper parts of Swaledale and Wensleydale, it will be remembered that the hill slopes are composed of the Yoredale series of strata, and that this consists of six parallel bands of limestone with thick interpolations of eugeogenous rock. "Where it exists complete" writes Professor Phillips, "as at the head of Wensleydale the Yoredale series admits of being exactly characterised in a drawing, so that its parts may be again recognized in other situations. For example, take the profile of a mountain whose top is capped with Millstone Grit and whose base rests upon the Lower Scar Limestone, its whole slope being formed of Yoredale rocks 800 to 1000 feet thick and the series complete. The profile will present the following leading features. At the top of the series under a round or angular top of Millstone Grit and perhaps a small edge of Chert or Little Limestone the Main or Twelve fathom Limestone will project into a bold perpendicular scar: below it will be a little concave or flat slope terminated by a second and less conspicuous projection of the thinner Underset Limestone: a long slope succeeds, simple or slightly varied with rising undulations corresponding to the hard gritstones interstratified with shales: this ends above a single or double scar of the Middle Limestone, which is very conspicuous where thick, as in Addleburgh and Penhill, but easily lost by the detritus of the superior rocks where it is thin, as above Hawes: below this there is another slope to the Simonside limestone which forms a smooth terrace: another steep slope to the Hardraw Limestone, which runs for

miles along both sides of Wensleydale in a remarkable terrace, occasionally wooded, always very abrupt and rocky at the edge, and based upon a steep slope of plates leading to the broad floors of the Lower Scar Limestone." In its general lithological characters the Millstone Grit much resembles the Lower Oolite and its peaks and ridges rise above the Main Limestone scars with usually the same rotundity and undulation of slope and the same comparative humidity of surface which have just been mentioned as characteristic of the northern range of moorlands situated on the east of the Central Valley.

There is in "Rokeby," the description of a glen of each kind: the gill where the Greta below Mortham flows beneath scars of Main Limestone to pour its waters into the Tees; and the neighbouring hollow of Thorsgill with its gradual arenaceous slopes. Here we have not only the physico-geographical facts, but also the ideas and imaginations thereby suggested.

#### THE GLEN OF THE GRETA.

" By Bernard's bridge of stately stone  
The southern bank of Tees they won,  
Their winding path then eastward cast,  
And Eglestone's grey ruins past;  
And skirting high the valley's ridge  
They crossed by Greta's ancient bridge,  
Descending where her waters wind,  
Free for a space and unconfined,  
As 'scaped from Brignal's dark wood glen  
She seeks wild Mortham's deeper den.

The open vale is soon passed o'er,  
Rokeby though nigh is seen no more;  
Sinking 'mid Greta's thickets deep,  
A wild and darker course they keep;  
Broad shadows o'er their passage fell,  
Deeper and narrower grew the dell,  
It seemed some mountain rent and riven,  
A channel for the stream had given,  
So high the cliffs of limestone grey  
Hung beetling o'er the torrent's way,  
Yielding along their rugged base  
A flinty footpath's niggard space,  
Where he who winds 'twixt rock and wave  
May hear the headlong torrent rave,  
And like a steed in frantic fit  
That flings the froth from curb and bit,

#### THORSGILL.

" When Denmark's Raven soared on high  
Triumphant through Northumbrian sky,  
Till hovering near, her fatal croak  
Bade Reged's Britons dread the yoke,  
And the broad shadow of her wing  
Blackened each cataract and spring  
Where Tees in tumult leaves her source  
Thundering o'er Caldron and High Force,  
Beneath the shade the Northmen came,  
Fixed on each vale a Runic name,  
Reared high their altar's rugged stone,  
And gave their gods the land they won.  
Then Balder, one bleak garth was thine,  
And one sweet brooklet's silver line,  
And Woden's Croft did title gain  
From the stern father of the slain,  
But to the Monarch of the mace  
That held in fight the foremost place,  
To Odin's son and Siffa's spouse  
Near Starforth high they paid their vows,  
Remembered Thor's victorious fame,  
And gave the dell the Thunderer's name.  
Yet Scald or Kemper erred, I ween,  
Who gave that soft and quiet scene,  
With all its varied light and shade,  
And every little sunny glade,  
And the blithe brook that strolls along  
Its pebbled bed with summer song,  
To the grim god of blood and scar,

## THE GLEN OF THE GRETA.

May view her chafe her waves to spray  
O'er every rock that bars her way.

The cliffs that rear their haughty head  
High o'er the river's darksome bed  
Were now all naked wild and grey,  
Now waving all with greenwood spray;  
Here trees to every crevice clung  
And o'er the dell their branches hung,  
And there all splintered and uneven  
The shivered rocks ascend to heaven;  
Oft too the ivy swathed their breast  
And wreathed its garland round their crest,  
Or from the spires bade loosely flare  
Its tendrils in the middle air,  
As pennons wont to wave of old  
O'er the high feast of Baron bold  
When revelled loud the feudal rout  
And the arched halls returned their shout;  
Such and more wild is Greta's roar,  
And such the echoes from her shore,  
And so the ivied banners gleam  
Waved wildly o'er the brawling stream."

## THORSKILL.

The grisly king of northern war.  
Oh, better were its banks assigned  
To spirits of a gentler kind!  
For where the thicket groups recede  
And the rath primrose decks the mead,  
The velvet grass seems carpet meet  
For the light fairies' lively feet;  
Yon tufted knoll with daisies strewn  
Might make proud Oberon a throne,  
While hidden in the thicket nigh  
Puck should brood o'er his frolic sly,  
And where profuse the wood-vetch clings  
Round Ash and Elm in verdant rings  
Its pale and azure-pencilled flower  
Might canopy Titania's bower.  
Here rise no cliffs the vale to shade,  
But skirting every sunny glade,  
In fair variety of green,  
The woodland lends its sylvan scene,  
And all beneath at random grow  
Each coppice dwarf of varied show,  
Or round the stems profusely twined  
Fling summer odours on the wind."

*Their influence upon the topography of the vegetation.* The rocks of the different kinds furnish to unite with vegetable humus to make the soils above them a detritus more or less abundant in proportion to their permeability, sometimes clayey, sometimes sandy, sometimes partaking of the two natures combined: and in the low country bands of diluvial clay and sand and gravel, the contributions from all the different beds mixed up together, usually overspread the subjacent rock to a considerable depth. Upon the permeability on a grand scale of its subjacent strata and the proportion in which the different kinds of detritus enter into the composition of its subsoils the natural fertility of any particular tract of country and the sort of stations which it furnishes for wild plants to grow in, to a considerable extent depends. The difference between the different kinds of soil in their power of absorbing and retaining moisture is very great. If we take a quantity of dry sand and put it into a bag and pour water upon it, we shall find that it will not absorb more than a quarter of its own weight of the water: but vegetable loam will absorb 40 or 50 per cent of its own weight, and pure dry argillaceous clay as much as 60 or 70 per cent. A predominance of clayey detritus in a soil gives to it consistency, tenacity, impermeability; a predominance of sandy detritus powderyness, mobility and divisibility. Argillaceous soils are comparatively humid and cold and in dry weather become hardened and form a crust upon their surfaces.

Arenaceous soils offer the opposite advantages and disadvantages; they are often light and sterile and in dry weather soon become at their surfaces arid and parched.

In the chapter upon Climate we have seen how the ripening of the hay crop and harvest in the low country is in an ordinary season accelerated before the average on the light sandy soils, retarded behind the average on the humid clayey soils: and how the difference between heavier soils and a somewhat more northern exposure and lighter soils and a more sheltered situation makes at equal altitudes between different parts of our field of study the difference between the Vine, the Fig and the Spanish Chesnut yielding or not yielding eatable fruit. In Istria M. Tommasini appraises the superiority of the light soils underlaid by limestone over the heavy soils underlaid by argillaceous rock at 2 degrees of Reaumur's thermometer, even although the former are somewhat hilly and also more northern in position. We have seen also what is the difference in the yield of the Cereal crops between the argillaceous soils of Cleveland and the comparatively porous soils of the Central Valley, and with regard to wild plants we find that there is for them upon the well marked argillaceous soils a comparatively restricted range of station, and that in tracts of country underlaid by rock of this character and overlaid by detritus in which the argillaceous element preponderates the wild plants which occur are mostly such as are widely distributed throughout Britain and ascend to high latitudes and altitudes: whilst not unfrequently in sandy soils we have pascual and glareal species which are less abundant and less boreal in their distribution. Under equal climates and at equal elevations, we may say safely that an argillaceous soil has a more humid and a more boreal vegetation: an arenaceous soil, unless overspread by heath, a flora more varied and more southern. As determining differences between the floras of limited tracts the results of this difference may be traced, but throughout the various parts of our low country the different kinds of soil are so much mixed up together that as regards its application to the topography of our vegetation this is all the result that can fairly be attributed to it with clearness.

The most prominent contrasts concerning topography of vegetation of which we have to speak are in the first place the restriction of a category of specially Xerophilous or dry-loving species to the dyseogenous soils in such a way that this restriction is one of the most prominent features of their role of distribution: and in the second place as regards the modification which the influence of the subjacent rock exercises upon the altitu-



dinal range of certain species. Though to a certain extent it involves the repetition of what has been already dwelt upon, I will quote from my note book, in order to connect together more clearly what follows with what has been stated already, two extracts which give an account of excursions made to hills of the two lithological types and which enumerate also the commoner or more conspicuous plants which the two hill-surfaces and their slopes produce.

*"The Harriot Air near Rievaulx, and Ouldray Gill.* A plateau with the beds of limestone rock not far from the surface, covered with elastic wiry grassy turf, the constituent elements of which are the common plants of pastures, but scattered over with *Carlina* and Bee orchis, and with Thyme and Rock-Rose and *Poterium Sanguisorba* in knolls upon its undulations, and a few scraggy bushes of hawthorn and a few blocks of hard massive calcareous gritstone scattered over its slope in the direction of the main dale.

The plateau is about 600 feet in elevation above the sea-level, and there are two or three farm houses upon it, with Sycamore and Scotch Fir planted to shelter them from the moorland breezes, and there are fields of Oats and Rape and forage, bounded some of them by hedges of Whitethorn and Blackthorn, and some of them by walls the art of building which must certainly require a special apprenticeship, for the blocks, which are this same compact calcareous gritstone, are of all kinds of sizes and of all kinds of shapes except absolutely round, and yet no cement or mortar is employed. The prominent mosses of the walls are *Leskea sericea* and *Tortula ruralis*, the prominent lichens *Parmelia calcarea* and *murorum*, *Collema nigrum*, *Biatora rupestris* and the pitted *Lecidæ* and *Verrucariæ*. Upon the plateau there are no natural streams or ponds, nothing but artificial specimens of the latter, glaringly artificial in their primness of contour, the work perhaps of the professional "artificial pond-maker" whose sign is to be seen at Helmsley.

The main gill is approached in this direction down a narrow gradually-sloping gorge, dark with overshadowing woods, with mainly, now that the Primroses and Wood Anemones have gone, a thick undergrowth of the Geums and *Allium ursinum*, and with abundance of the tall succulent branching stems and lurid digitated leaves of *Helleborus viridis* and here and there bushes of *Actæa spicata* scattered amongst it, the sombre greenness pleasantly relieved by *Lychnis* and *Stellaria*, by patches of fresh bright blue which *Myosotis sylvatica* and the Hyacinth furnish, and the bright golden globes of a colony of *Trollius* which has established itself at the bottom of the wood.

The principal gill is one of a thoroughly calcareous stamp, such an one as these hills of the Middle Oolite abound in. The steeply sloping bank upon the north-west is not less than 300 or 400 feet in height and is covered thickly with aboriginal wood, the Oak the principal tree, but far more of Hazel than anything else, Ash, Hawthorn, Wych Elm, *Salix Caprea*, Elder, Maple, Honey suckle, Roses and Brambles. The soil over the subjacent rock is thin and gravelly. There is a glorious undergrowth of *Rubus saxatilis* beneath the bushes, plenty to yield a large basket-ful of Rock Brambles at the fruiting time, and abundance of *Origanum vulgare* and wiry grass and sedge, (*Brachypodium sylvaticum*, *Bromus asper*, *Melica nutans*, *M. uniflora*, *Carex digitata*, *C. glauca*, *C. sylvatica*,) and in lesser quantity *Aquilegia* and *Actæa*, *Viola hirta*, *Hypericum hirsutum* and *montanum*. Upon the opposite side of the gill the soil is damper and more loamy and *Lathrea* and *Neottia* may be found, upon the stones abundance of *Hypnum murale*, and upon the lower edge of the wood *Polypodium Dryopteris* and Bilberry, *Blechnum boreale* and *Calluna*.

There is no stream till we reach the surface of the Oxford Clay, 400 feet below the top of the plateau, and then a bright clear little brook gushes out and soon gathers to a rivulet of tolerable size, fed by springs the outpouring of which trickles through oozy plashe rich with bright green and purple moss, (notably *Hypnum condensatum* and also *Bryum ventricosum*, *H. cuspidatum*, *H. revolvens*, *H. nitens*, *Mnium affine* and *Bartramia calcarea*,) and diversified by swamp Carices (*C. fulva*, *C. flava*, *C. dioica*, *C. pulicaris*, *C. stellulata*) *Eriophorum latifolium*, *Primula farinosa*, *Lychnis Flos-cuculi*, *Caltha* and *Epipactis palustris*. In one place there is a swampy thicket filled with bushes of *Salix Andersoniana*. At the lower part of the gill there is a space of pasture land on both sides of the stream and some of the woods upon its slope consist of planted Coniferæ. It is altogether about three miles in length and opens out at the town of Helmsley."

"*Rumbald's Moor and the Cow and Calf Rocks over Ilkley*. Between the two dales (Wharfedale and Airedale) there is a ridge of hill which is here some three or four miles across, which rises at the centre of the ridge to a height of 1300 feet, and over the edge of the dales is from 900 to 1000 above the sea-level, 600 to 700 feet above the main streams. Everywhere from the watershed to the dale edges sweeps a continuous surface of undulated turfy heatherland, over the sandstone a thinner or thicker covering of soft rich brown peat and everywhere that same so well known gregarious heatherland vegetation. Far away it sweeps, miles to eastward along

where the ridge grows lower and narrower, and the dales open out, and the towns grow larger and busier and smokier, far away to westward where the dales grow narrower and steeper, and the ridges higher and the summits rise, hundreds and hundreds of square miles in area over the higher ground, one broad surface of treeless, houseless, uncultivated moor. Of the Ericaceous shrubs *Calluna vulgaris* is much the most abundant and there are also *Erica cinerea* and *Tetralix*, *Empetrum nigrum* and *Vaccinium Myrtillus*, thick-swelling in the hollows and over the turfy undulations, stunted and rough where the ground is drier and the rock nearer the surface. In the drier places *Juncus squarrosus*, *Galium saxatile*, *Nardus stricta* and *Aira flexuosa* are the most prominent plants and of the ferns *Blechnum boreale* and the Common Brake. Amongst the heather *Hypnum splendens* is the commonest moss and of the Lichens *Cetraria aculeata* and *Cladonia rangiferina* and *coccifera* and in the spaces between the tufts are *Polytrichum commune* and *Dicranum scoparium*. In the swamps grow *Scirpus cespitosus*, *Eriophorum vaginatum* and sometimes *Drosera rotundifolia* and *Narthecium*, and in pools and peaty rills abundance of *Hypnum fluitans*, *Leucobryum glaucum* and various species of *Sphagnum*. Where the turf has been bared away for fuel are *Polytrichum piliferum* and *juniperinum* and wide spreading patches of *Ceratodon purpureus*. *Vaccinium Vitis-idea* is not plentiful here and *V. Oxycoccus* I know in this neighbourhood in one swamp only, where *Corydalis claviculata* grows upon the rock below.

The crest of the hill is marked by an irregular line of scar-like "edges" of gritstone, huge boulders of which are piled about in picturesque confusion immediately beneath the edge and scattered more sparingly far down below towards the bottom of the slope : and the walls along the hill side and over the moor-top are built of loosely-piled blocks of this same gritstone, which is a sandstone of coarse grain and moderate firmness of texture, with large crystals of quartz thickly imbedded amongst it. As in all the gritstones the blocks are rough and unshapely and are much pitted and channelled by the influence of time and weather. There are numerous lichens upon the rocks and walls, *Endocarpon smaragdulum*, *Biatora polytropia*, thin-crusts black-fruited *Lecideæ*, *Parmelia saxatilis*, physodes and other foliaceous species, fringe-like tufts of *Evernia jubata* and *furfuracea* : and in the shaded sandy ground beneath the rocks and in the trenches by the wall sides abundance of *Dicranum heteromallum* and *Jungermannia albicans*. The peaty rills gradually converge to the head of a little grassy gill, and the streamlet which they form, not as in the

limestone sinking through the surface of the hill to appear as a full grown rivulet at the foot of its slope, makes its way down the hill-side with much animation, at first forcing a road down a narrow channel where it is almost hidden by overhanging grasses and rushes, and gathering as it goes, fed by numerous tiny watercourses edged by *Stellaria uliginosa* and *Montia fontana*, now leaping with foam and bubbles over a moss-fringed rock that would interpose to bar its progress and ever and anon spreading out into a more open channel and rippling noisily over the scattered pebbles. The principal mosses of the stream are *Racomitrium aciculare*, *Hypnum flagellare* and a form of *Hypnum palustre*: and the swamps upon the hillsides yield abundance of *Sphagna*, *Bartramia fontana*, *Bryum ventricosum*, *Aulacomnion palustre*, *Hypnum fluitans*, *cuspidatum* and *stramineum*: and of the less frequent species the bogs yield *Hypnum exannulatum* and *Mnium subglobosum* and the walls and rocks *Dicranum fuscescens*, *Weissia cirrhata* and *Ptychomitrium polyphyllum*. The natural woods of the hillside are principally Oak, with more Rowan and Birch, and less Hazel and Ash than in the limestone dales, with more of swamp (with *Chrysosplenium*, *Caltha*, *Cardamine sylvatica*, *Crepis paludosa*, *Equisetum Telmateia*, *Spiræa Ulmaria*,) and less of underwood and entirely without the characteristically *Xerophilous* species."

Amongst the higher moorlands of the west there is a difference in vegetation which is conspicuously connected with the difference between the hills of the two types in respect of humidity of surface. Into the Upper zone three of the limestone hills ascend, Micklefell, Camfell, and Widdale fell: and within its limits the surfaces of these are covered in some places with a short grassy turf which yields several of the species which are common in grassy places throughout the low country, and in the crevices of the limestone rock a few ferns and other shade-loving plants occur, and a few of the characteristically Montane species are also to be met with, as for instance *Draba incana*, *Viola lutea*, *Saxifraga hypnoides* and *Arenaria verna*. To those portions of these three hills where the limestone rock is at or near the surface fully two-thirds of the Flowering Plants and Ferns which ascend into the Upper zone are restricted. Which these species are can be ascertained so readily by a glance through the list in the Botanical portion of these notes that it does not appear needful to recapitulate them here. But the far more numerous arenaceous peaks and ridges which ascend into the Upper zone present everywhere what a botanist on the outlook for rarities is apt to consider a monotonous repetition of the common gregarious plants of a swampy heatherland, so that the following

florula, which is a list of all the species observed within the limits of the Upper zone upon Raven's Seat moor and Nine Standards might, with very little variation, stand for any of the other hill summits of the eugeogenous type.

FLORULA OF THE UPPER ZONE ON A EUGEOGENOUS HILL.

*Drosera rotundifolia*  
*Cerastium triviale*  
*Rubus Chamæmorus*  
*Galium saxatile*  
*Erica Tetralix*  
*Calluna vulgaris*

*Vaccinium Myrtillus*  
*Juncus effusus*  
*squarrosus*  
*Empetrum nigrum*  
*Scirpus cæspitosus*  
*Eriophorum vaginatum*

*Eriophorum angustifolium*  
*Agrostis vulgaris*  
*Aira flexuosa*  
*Festuca ovina*  
*Nardus stricta.*

Throughout the moorlands both upon the east and west of the Central Valley this swamp-heatherland vegetation attains its greatest perfection and covers without intermission the widest tracts of surface over the Millstone Grit and the Lower Oolite: whilst the dysgeogenous hills are more grassy and in the two upper zones it is far more usually amongst the scars of the limestone and the short grassy turf which the limestones immediately underlie that the ascending stations of the common pascual, pratal, mural and glæreal plants of the low country are to be found. A glance at the botanical list will shew how very frequently the "Main Limestone" and the "Hambleton plateau" are mentioned in connection with the ascending limits of species. And on the other hand, the heatherlands of the Central Valley are all based upon sandstone, and with them *Drosera anglica*, *Vaccinium Oxycoccus*, *Listera cordata*, *Lycopodium Selago*, *L. selaginoides* and several of the Montane mosses descend to their lowest stations, where they meet and mingle with such species as *Gentiana Pneumonanthe*, *Mentha Pulegium*, *Centunculus minimus*, *Spergularia rubra*, *Cerastium semidecandrum*, *Hypericum elodes*, *Radiola Millegrana*, *Ornithopus perpusillus* and *Lycopodium inundatum*.

It is in the tract of the Middle Oolite that the characteristically Xerophilous species have their head quarters. The following species are the most typical representatives of this category and are either absolutely or very nearly restricted in North Yorkshire to the scars and dry banks of the Middle Oolite, the Magnesian Limestone and the Mountain Limestone, avoiding altogether or growing but very sparingly in the eugeogenous three-fourths of the area of the Riding.

## LIST OF CHARACTERISTICALLY XEROPHILOUS SPECIES.

*Comparatively frequent species*

<i>Helleborus viridis</i>	<i>Spiraea Filipendula</i>	<i>Convallaria majalis</i>
<i>Aquilegia vulgaris</i>	<i>Pyrus Aria</i>	<i>Carex digitata</i>
<i>Actaea spicata</i>	<i>Carduus eriophorus</i>	<i>Sesleria cærulea</i>
<i>Hutchinsia petraea</i>	<i>Salvia verbenaca</i>	<i>Avena pratensis</i>
<i>Helianthemum vulgare</i>	<i>Calamintha officinalis</i>	<i>Bromus erectus</i>
<i>Hypericum montanum</i>	<i>Taxus baccata</i>	<i>Brachypodium pinnatum</i>
<i>Geranium sanguineum</i>	<i>Orchis pyramidalis</i>	<i>Hordeum sylvaticum.</i>
<i>Astragalus glycyphyllos</i>	<i>Ophrys apifera</i>	
„ <i>Hypoglottis</i>	„ <i>muscifera</i>	

*Local and less abundant species*

<i>Anemone Pulsatilla</i>	<i>Potentilla verna</i>	<i>Thymus Chamædrys</i>
<i>Helianthemum canum</i>	<i>Galium erectum</i>	<i>Calamintha Nepeta</i>
<i>Linum perenne</i>	<i>Asperula Cynanchica</i>	<i>Epipactis ovalis</i>
<i>Hippocrepis comosa</i>	<i>Inula Conyza</i>	<i>Ceterach officinarum</i>
<i>Onobrychis sativa</i>	<i>Orobancha rubra</i>	<i>Polypodium calcareum.</i>

Of these forty species, thirteen are restricted to the West of the Central Valley and three to the East, but the remaining twenty-four grow both upon the east and the west of it. Of the distribution of the latter that of *Aquilegia vulgaris* will afford a fair average illustration.

So far as known to me the Wild Columbine grows in North Yorkshire as follows, excluding from consideration two or three stations where it is plainly a 'garden escape. Amongst the western hills in Swaledale in woods at the Round Howe and on the north side of the river near Applethorpe, and in the Yore district in Fossdale Woods, in all these three cases amongst the scars of the Yoredale limestone; and also in Wensleydale by the Yore side about the Aysgarth rapids upon the Lower Scar Limestone. From the tract underlaid by the Millstone grit series it is altogether absent. Where the Magnesian Limestone comes to the surface it grows in woods by the Wharfe side at Thorp Arch. It overleaps altogether the New Red Sandstone of the Central Valley and is absent also from the tracts underlaid by the Lias and the Inferior Oolite. Amongst the woods of the calcareous embankments of the hills of the Middle Oolite it grows plentifully in Yowlesdale, Beckdale and several other places about Helmsley and Hawnby and Pickering, in the Howardian tract in several stations and in the dale of the Derwent near Hackness. From the Vale of Pickering it is altogether absent.

So that we have the plant growing more or less abundantly in all the tracts (see table at page 70) which are underlaid by the dysgeogenous beds, but entirely absent from the wide intermediate areas underlaid by the more porous and more humid strata. It follows the limestone from east to west through the irregularities of its dispersion and is entirely restricted to that fourth portion of the area of North Yorkshire to which the limestone is restricted. How closely the distribution of many of these Xerophilous species corresponds with that of *Aquilegia* a glance at what is said respecting them in the botanical portion of these notes will shew. The following species shew clearly a similar lithological restriction, but not in a manner so decidedly marked as in the case of those which have already been named.

## LIST OF SUBXEROPHILOUS SPECIES.

*Ascending Plants.*

*Arabis hirsuta*  
*Viola hirta*  
*Cerastium arvense*  
*Anthyllis Vulneraria*  
*Rosa spinosissima*  
*Poterium Sanguisorba*  
*Pastinaca sativa*

*Dipsacus pilosus*  
*Scabiosa Columbaria*  
*Lactuca virosa*  
*Carlina vulgaris*  
*Campanula glomerata*  
*Gentiana Amarella*  
*Ligustrum vulgare*

*Atropa Belladonna*  
*Origanum vulgare*  
*Calamintha Acinos*  
*Lithospermum officinale*  
*Juniperus communis*  
*Spiranthes autumnalis*

*Descending plants.*

*Draba incana*  
*Arenaria verna*  
*Dryas octopetala*

*Rubus saxatilis*  
*Galium sylvestre*  
*Gentiana verna*

*Melica nutans*

In these two lists aboriginally native species only have been included and together they take in about one in thirteen of our indigenous flowering plants and ferns. When these species pass beyond the limits of the dysgeogenous fourth of North Yorkshire they always grow over dry sandy rock or dry sandy or gravelly detritus, avoiding the clayey and rich heavy soils. Next to the immediate neighbourhood of compact calcareous rock they evidently prefer stations where sand so loosely bound together that water sinks readily through it predominates, a circumstance which indicates pretty conclusively that it is the dryness of the limestones rather than their chemical composition which is the chief source of attraction. Several of them are to be met with upon the coast sand-hills in the neighbourhood of Redcar: a few of them are found in the vicinity of the basaltic dike in

Cleveland : more of them amongst the subcalcareous portions of the Inferior Oolite, as at Boltby and especially where in the Howardian tract the calcareous character of the interposed band is most clearly marked. Some of the commonest of the Subxerophilous species are scattered at intervals over the sandier parts of the Central Valley and may be found in such stations as the Ouse side along the Clifton Ings, the banks of the Swale at Topcliffe, of the Tees between Stapleton and Croft and the gravelly soils of the neighbourhood of Bedale and Kirklington.

M. Thurmman gives for the portion of Central Europe which includes the Vosges and the Jura both a list of the indigenous plants and an account of their distribution with regard to the subjacent rocks. Comparing the British flora as a whole with that of this region or indeed with that of any other part of the interior of Central or Southern Europe we see even by glancing over the mere list of names how conspicuously with us the damp-loving element predominates. When a British and Foreign Cybele is written, a work giving an account of the distribution of British plants through foreign countries and of the relation of our indigenous flora to that of Europe as a whole, this is one of the points which its author will have to explain to us and illustrate for us in detail. Out of 50 species which M. Thurmman gives as being within his limits the commonest plants which are characteristic of dysgeogenous tracts we have in North Yorkshire as indigenous plants eight species only : out of the fifty species which he names as the commonest plants which are characteristic of the eugeogenous tracts within his limits we have in North Yorkshire thirty-one species.

With us several of the most characteristically paludal plants which are common in the neighbourhood of York and Thirsk are altogether confined to the vales and nowhere ascend into the dales or amongst the lower-levels of the hill-slopes. This is the case with *Thalictrum flavum*, *Nymphaea alba*, *Nasturtium amphibium*, *Cerastium aquaticum*, *Utricularia vulgaris*, *Hottonia*, *Hydrocharis*, *Sagittaria*, *Butomus*, *Potamogeton densus*, *Lemna trisulca* and several other species.

In Central Europe we have, as in North Yorkshire, ranges of hills of well-marked contrasting lithological character, the Jura dysgeogenous and the Vosges and Black Forest eugeogenous. The following are the thirty-one species which inhabit North Yorkshire which are given by M. Thurmman as characteristically eugeogenous. These are plants which ascend and are frequent amongst the eugeogenous Vosges and Black Forest but are either rare amongst or altogether absent from the dysgeogenous Jura, under parallel or nearly parallel conditions of atmospheric climate.



LIST OF NORTH YORKSHIRE PLANTS WHICH ARE CHARACTERISTICALLY  
EUGEENOUS IN CENTRAL EUROPE.

<i>Orobis tuberosus</i>	<i>Stellaria holostea</i>	<i>Senecio sylvaticus</i>
<i>Prunus Padus</i>	<i>Trifolium fragiferum</i>	„ <i>aquaticus</i>
<i>Betula alba</i>	<i>Luzula multiflora</i>	<i>Spergularia rubra</i>
<i>Sarothamnus scoparius</i>	<i>Filago minima</i>	<i>Vaccinium Myrtillus</i>
<i>Quercus sessiliflora</i>	<i>Aira cæspitosa</i>	<i>Juncus squarrosus</i>
<i>Calluna vulgaris</i>	<i>Alopecurus pratensis</i>	<i>Meum athamanticum</i>
<i>Aira flexuosa</i>	<i>Triodia decumbens</i>	<i>Digitalis purpurea</i>
<i>Hieracium boreale</i>	<i>Rumex Acetosella</i>	<i>Galium saxatile</i>
<i>Ononis spinosa</i>	<i>Montia fontana</i>	<i>Saxifraga stellaris</i>
<i>Jasione montana</i>	<i>Nardus stricta</i>	
<i>Hypericum pulchrum</i>	<i>Hypericum humifusum</i>	

We see that we have in this list most or very nearly all the very species which make up the gregarious swamp-heatherland vegetation of which we have spoken as covering in our country such wide tracts of surface. These species are several of them our commonest North Yorkshire plants and ascend amongst the moorlands of both lithological types, the difference for them as a class, being certainly, as has been already said, a greater degree of frequency and luxuriance in the eugeogenous tracts; but not such a restriction as we have seen there is in the case of the plants of the dry-loving category.

To sum up then the bearings of the subjacent rocks upon the topography of our North Yorkshire vegetation as tested by a comparison of the distribution of species within our limits and in the country respecting which M. Thurmann treats we may say;

1. As compared with the flora of Central Europe the flora of North Yorkshire is one of a predominantly damp-loving stamp.
2. The species which in Central Europe are restricted to dysgeogenous tracts only occur in North Yorkshire in small number and are there restricted lithologically in a similar manner.
3. The species which in Central Europe are restricted to eugeogenous tracts are many of them plants of North Yorkshire also: and under the more boreal and more humid climate grow abundantly and cover wide areas of surface, without keeping up any clearly-marked role of lithological restriction.

And this shews us clearly that the nature of the subjacent rock both may and does interfere to modify the influence of atmospheric climate upon plant-topography, and it points out also in what direction the interfer-

ence operates. A more porous and more humid soil evidently to some extent compensates for a drier climate. In proportion as the climate is damper the characteristically dry-loving species are more and more rigidly restricted to dry-soiled tracts of country. This is the rule and in botanico-geographical considerations it is evidently worth bearing in mind: but to what extent it has operated in determining which species we should have and which we should not have either in North Yorkshire or in Britain as a whole; to what extent it has for instance operated in the restriction to the area which they occupy in our country of the plants of Mr. Watson's Germanic type of distribution we can but guess vaguely.

The rich bryological flora of North Yorkshire has its head quarters amongst the well irrigated porous-rocked eugeogenous hills and slopes.\* To these nearly all the characteristically Montane species are restricted and amongst them most of the common mosses attain their greatest abundance and luxuriance. A few species, notably *Neckera crispa*, *Tortula tortuosa*, and *Trichostomum flexicaule* are common everywhere amongst the rocks of the dysgeogenous hills and almost entirely absent from the eugeogenous tracts. And what has been said of the mosses will apply with precision to the Lichens: a good list of species for North Yorkshire as a whole, the more northern species confined to, and the commonest species attaining their greatest abundance and luxuriance amongst the eugeogenous hills, a few species almost invariably associated with the calcareous rocks and almost confined to them.

*The precipices and waterfalls.* The unequal waste of different kinds of rock is also worthy of attention in its bearing upon two conspicuous features of scenery. First, the precipices. Along a great part of the coast line, the cliffs have a compact arenaceous cap over a more or less considerable thickness of mainly argillaceous groundwork. In Whitstoncliff and the other scars of the Middle Oolite a mass of compact limestone rests upon a base of Oxford Clay, and we have seen how in the west, clays are interpolated between every band of the Mountain Limestone. The lower part of these cliffs wastes away faster than the upper. At first the upper part overhangs, becoming all the time gradually loosened by rains and frosts, till at last it becomes overbalanced and falls with a tremendous crash, strewing the hillside or beach with its broken blocks. Lastly, the water-

\* Though Teesdale is coloured as subdysgeogenous in the Map it can scarcely be considered as such without great exception and what is said above does not apply to it. In fact strata of both lithological types are in Teesdale so much mingled together that it presents the characteristics of both the types combined. It has the heatherland and swamps, the irrigated cliffs and gills, the rich bryology and lichenology of the eugeogenous hills and furnishes also upon the limestone and basalt many of the characteristically Xerophilous species.

falls. Here again the softer rocks are wasted away and those composed of less porous and harder material remain. The numerous falls of Wensleydale are, with only one conspicuous exception, over the different bands of limestone: in the exceptional case, Milgill force, the edge rock is one of the firm gritstones of the Yoredale series. Keasdon force in Swaledale is over Limestone: the Caldron Snout, the High force, and the falls of Maze Beck and Blea Beck over Basalt. Thomasson's force and the other minor falls of Cleveland are over hard edges of Inferior Oolite. And almost invariably the fall is approached by a steep glen, which, in course of time, the stream has excavated, along the sides of which the cap-rock of the fall stands out in prominent relief.

## **PART SECOND.**

## PART SECOND.

### TOPOGRAPHY AND PHYSICAL GEOGRAPHY.

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#### CHAPTER IV.

##### DRAINAGE DISTRICTS AND GEOGRAPHICAL CATEGORIES OF PLANTS.

*Drainage districts.* The nine districts into which North Yorkshire is subdivided in the largest of the four maps which accompany these notes are founded upon the river drainage, and are, with exceedingly trifling exception, separated from one another either by rivers or lines of watershed, not like wapentakes and parishes, by purely arbitrary and conventional lines of limitation. These drainage districts are mapped out and used to answer a twofold purpose: in connection with physical geography to help the mind of those who use this volume to dwell with the prominence to which its importance from this point of view entitles it upon the question of how our field of study is made up of river-basins and what is their extent and configuration: and in connection with botany to aid in tracing out and illustrating the topography of its vegetation. It will be observed, that with very little exception, the boundaries of North Yorkshire as a whole, are natural boundaries also. In this second part of the work it is intended to pass each of these nine drainage districts under review, and to speak, as we do so, of its more prominent natural features and characteristics, mentioning as we pass along the towns and principal villages which each includes, its hills and its glens and its waterfalls, and also the more noteworthy botanical stations and the plants which they produce.

The following table gives an estimate of the area of each of the districts in square miles and classifies them under the vice-counties of the Cybele Britannica to which they belong.

THE DRAINAGE DISTRICTS.	
NAME OF THE DISTRICT.	ITS AREA IN SQUARE MILES.
NORTH WEST YORKSHIRE.	
9 West Tees .. .. .	190
8 West Swale .. .. .	370
7* Ure or Yore .. .. .	260
MID WEST YORKSHIRE.	
6 Nidd and Wharfe (Ainsty)	84
NORTH EAST YORKSHIRE.	
5 East Tees .. .. .	155
4 Esk .. .. .	235
3 Derwent .. .. .	515
2 East Swale .. .. .	170
1 Ouse and Foss .. .. .	133
Total	2112

*Topography of the plants as illustrative of facts of physical geography.* The following appears to be the most natural classification of the plants of North Yorkshire in respect of their geographical relations.

1. *The Montane species*, those plants which (see the chapter on Climate) are either absolutely restricted to the hills and slopes, or are much more frequent there than in the vallies.

2. *The Xerophilous species*, those plants which (see the chapter on Lithology) are absolutely restricted to or which are much the commonest in the dysgeogenous tracts, growing normally either upon calcareous or basaltic rock or dry ground which these immediately underlie, some of them casually also in dry sandy places elsewhere.

3. *The Maritime species*, those plants which are essentially restricted to the neighbourhood of the sea, and three species are also included here which are normally maritime but which grow also casually in the interior. North Yorkshire is not rich in characteristically maritime plants. The coast cliffs yield very few and the only tract where they grow in any considerable abundance is the sweep of low marshland which borders the sea in the neighbourhood of Middlesbro' and Coatham.

4. *The Hygrophilous species* or plants of standing water. These are the lacustral or paludal plants of the low country, none having been in-

\* In Suppl. Flo. Yorks. this is given as belonging to Mid West Yorkshire of the Cybele: but I am informed by Mr Watson that its proper place is as stated above.

cluded here which ascend into the Middle zone. Though the total number of species which it includes is not conspicuously small, the North Yorkshire flora cannot be said to have a large infusion of this element but rather the reverse. Many of the species are restricted to two, three or four of the drainage districts.

5. *The General ascending species, i. e.* those which are ascertained to occur in all the nine drainage districts. As a general rule the plants which range here are both commoner and more abundant where they occur not only for North Yorkshire as a whole but also for each of the districts taken separately than are those of any of the other categories.

6. *The Scattered ascending species,* those which do not range under any of the preceding categories and which are ascertained to occur in not less than four of the drainage districts. Some of the ericetal and shade-loving plants which are plentiful amongst the hills come in here, and no doubt many species which further observation will shew to be really "General."

7. *The Local ascending species,* those which do not range under any of the preceding categories and are ascertained to occur only in from one to three of the drainage districts.

The following table shews for North Yorkshire as a whole what is the absolute number of the Native Flowering Plants and Ferns of each of these categories in its flora and the relative proportion which each bears to the whole flora as tested by number of species.

GEOGRAPHICAL ANALYSIS OF THE NORTH YORKSHIRE FLORA. TOTAL AREA OF NORTH YORKSHIRE 2112 SQUARE MILES.		
	Number of species	Per centage of total native flora.
1 Montane species .. ..	85	10
2 Xerophilous „ .. ..	66	8
3 Maritime „ .. ..	53	6
4 Hygrophilous „ .. ..	80	9
5 General ascending species	351	40
6 Scattered ascending „	177	20
7 Local ascending „	72	8
Total number of native species.	872	

For each of the drainage districts, as we pass them under review, a table similar to the above will be given: and it is very interesting to note the differences in respect of the way in which their floras are made up which the different districts show, and to attempt to trace out how far the difference in the composition of the nine floras runs parallel with the difference in physical character between the nine districts. Upon comparison of the analytical table which is given for each district with what is stated respecting its physical geography it will be seen that, in point of fact, this parallelism does exist to a remarkable extent. The districts which are comparatively rich in Montane species are those which have the most extensive and highest tracts of hilly ground: the districts which are comparatively rich in Xerophilous species are those which have a continuous extent of dry rock and dry surface soil with tabular hills and steep-banked dales: and the Rarer ascending species are highest in number in those districts which contain the greatest extent of low-lying level country. And it happens almost invariably that when the number of species of any of these geographical categories comparatively predominates in a district that there most of the species of that category grow in greater abundance than they do in a district in which the number of species is small. For instance, the number of Montane species which grow in the West Tees district is 77 and in the East Swale district is 23. If the total number of individual wild plants which grow in the two districts could be counted, I have no doubt that the squares of 77 and 23, that is to say 5929 against 529, would represent more truly the relative proportion of the two in respect of the number of individual plants of species of the Montane category which they would be found to yield than would the unmultiplied figures. In this way it is intended that the analytical tables and lists of rarer plants which are given under each drainage district should be considered as data in illustration of its physical geography. About a dozen species are given both as Montane and Xerophilous, but except these, each is given under a single category only.



## CHAPTER V.

### NO. 9. THE WEST TEES DISTRICT.

This district includes the whole of the Yorkshire portion of Upper Teesdale, so well known and so deservedly attractive, not to botanists and geologists only, but also to lovers of wild and picturesque scenery. The Tees rises upon the slope of Cross-fell, a mountain which towers upwards near the edge of the great Pennine escarpment to a height of 2900 feet. This is in Cumberland and the streams which flow from the western slope of the hill find their way into the Eden, whilst on the east only a narrow spur of moorland separates the head waters of the Tees from those of the Tyne. At the foot of this hill it is joined by Troutbeck and for five miles forms the boundary between Westmoreland and Durham. During this part of its course it flows towards the south-east, a gradually augmenting slowly declining stream almost lake-like in its breadth and stillness, with broad undulated tracts of boggy, heathery moorland rising steeply from it on either side. This long lake-like expansion is called the Weel. From the foot of Troutbeck its course is amongst the Lower Mountain Limestone, but not far from the head of the Caldron Snout, at a height above the sea-level of 500 yards, it enters the Basalt.

At the Caldron Snout the scene changes. First the water becomes ruffled, and then with a rush, the noise of which mingles with the whirr of the grouse and the bleating of the mountain sheep far away amidst these lonely hills, the stream breaks a gorge through the main mass of the Basalt, forming in so doing a series of broken rapids, leap after leap in tumultuous succession, the brown stream dashed by the first leap into foaming whiteness and rushing from ledge to ledge down a deep winding rocky channel, till at last it frees itself from the gorge, and spreads out as a ray of light spreads out as it issues from a prism, over a background of sharp-

edged broken basaltic columns. The total depth of the waterfall is two hundred feet and nowhere else in England have we so deep a fall upon so large a stream. The best point of view for the fall as a whole is the open ground a short distance below it upon the Westmoreland side of the Tees: and from the Birkdale sheep-fold the wooden bridge which spans the upper part of the waterfall, firm enough in reality, looks frail and dangerous. Above the fall massive angular reddish-brown basaltic crags rise steeply to a considerable height and on the Durham side of the stream they sweep round the edge of the fell for fully a mile, forming the range of broken and precipitous cliffs which is known by the name of Falcon Clints.

From the foot of the Caldron Snout to the sea the Tees forms the northern boundary of Yorkshire. Its general direction during the earlier part of its course is at first east and afterwards south-east. From the Caldron Snout to the junction of the Tees and Lune the distance is about ten miles and this is what may be considered as the Upper Teesdale portion of our drainage district. A rocky river channel ten miles in length with its stream declining in level during that distance about 600 feet, and a compact range of hills also sloping gradually towards the east, the summit of the ridge rising to an elevation of from 1000 to 1200 feet above the stream, these are the general physical features which it presents.

The extreme distance between the Tees and the Lune is not more than four miles. The rhomboidal mass of moorland which intervenes between the two streams culminates in a long ridge of limestone with patches of millstone grit over it at both its eastern and western extremities. This is Mickle fell,\* the highest of the Yorkshire summits, and the top of the western patch of gritstone is 2580 feet above the sea-level. The view from the summit on a clear day is very extensive. On the north-west there is a sudden fall in the direction of Maze beck and across a broad hollow may be seen a mass of hills in which the three peaks of Cross fell, Dun fell and Scordale head are conspicuous, and the head of a curious boat-shaped glen called High-cup Nick, and the far off peaks of the Lake country looming dimly on the edge of the horizon. Towards the north is the great Teesdale hollow, with Falcon Clints and the white streak of the Caldron Snout immediately in front, and behind them Widdy Bank and Harwood fell and the ridge of moorland which separates Teesdale from

\* The three Craven peaks, Wharfedale, Ingleborough and Pennygheat are better known than Micklefell and are often given as the highest Yorkshire hills. The height of Wharfedale is 2380 feet, of Ingleborough 2361 and of Pennygheat 2270.

Weardale, and lower down the dale, the fir plantations of the High Force and Winch Bridge, with wall-bounded bright green fields and the Duke of Cleveland's white-washed farm houses. On the east the view stretches over the woods and slopes and lower hills of the country round about Barnard Castle and Richmond and embraces the whole breadth of the richly-cultivated vale of York, and as far as the Hambleton Hills. And on the south over Lunedale and Balderdale and the Stainmoor depression are the innumerable undulated peaks which cluster round the upper part of Swaledale and Yoredale, and beyond them the more abrupt outlines of Whernside and Ingleborough and Pennyghent.

At the eastern extremity of the ridge at the summit of the slope towards Westmoreland *Myosotis alpestris* grows. The following are the other more noteworthy plants of the summit ridge, growing most of them in the hollows and crevices of the limestone.

*Draba incana*  
*Viola lutea*  
*Arenaria verna*  
*Saxifraga hypnoides*  
*Galium commutatum*  
*Gentiana verna*  
*Carex rigida*  
*Sesleria cœrulea*  
*Allosorus crispus*  
*Asplenium viride*  
*Andreæa alpina*

*Andreæa Rothii*  
*rupestris*  
*Dicranum fuscescens*  
*Distichium capillaceum*  
*Encalypta ciliata*  
*Bryum polymorphum*  
*julaceum*  
*Zierii*  
*Antitrichia curtipendula*  
*Hypnum heteropterum*  
*catenulatum*

From the summit ridge in the direction of Maze beck the descent is sudden, the distance being about a mile and the difference in elevation not less than 1200 feet. This slope is crowned by a small scar of Main Limestone, and is intersected by several streamlets, one of which takes its rise at the foot of the scar. The rarer plants of this slope are *Epilobium alsinifolium*, *Sedum villosum*, *Saxifraga stellaris*, *Hirculus* and *aizoides*, *Bryum pallescens*, *Tetraplodon mnioides* and *Hypnum sarmentosum*. The Maze beck only touches Yorkshire during the lower part of its course, and there separates the county from Westmoreland. Till it nears the Tees it is a mere moorland stream with a rocky channel, neither so broad or so deep but that it may be crossed under ordinary circumstances by means of the stones in its bed. During the lower part of its course the channel is deeper and the rocks steeper and the stream forms a series of small but picturesque rapids as it leaps from ledge to ledge of the Basalt. About these falls the following rarer plants grow.

<i>Trollius europæus</i> begins	<i>Grimmia torta</i>
<i>Potentilla alpestris</i>	<i>Racomitrium protensum</i>
<i>Rubus saxatilis</i>	<i>Zygodon Mougeotii</i>
<i>Galium boreale</i> begins	<i>Diphyscium foliosum</i>
<i>Hieracium anglicum</i>	<i>Bryum crudum</i>
<i>Salix phylicifolia</i> begins	<i>alpinum</i>
<i>Poa Parnellii</i>	<i>Zierii</i>
<i>Andræa Rothii</i>	<i>Fissidens osmundoides</i>
<i>Blindia acuta</i>	<i>Hypnum catenulatum</i>

Between the Caldron Snout and the High Force the distance is about five miles. During this part of its course the stream flows in a broad open channel exceedingly full of loose stones and rounded boulders and nowhere do its immediate banks rise to any considerable height. The average rate at which it here declines in level is about 75 feet per mile. Opposite Falcon Clints the moors of the Yorkshire side are not rocky but slope gradually and come closely up to the river, but soon the stream takes a sweep towards the north and a broad open space is left between the river and the fell, the first farmhouse is reached, and green fields begin. This is Upper Cronkley and the hill is called Cronkley Fell.

From the Mickle fell ridge to the plateau of Cronkley fell proper the tourist in descending has first to thread his way amongst a perfect labyrinth of peaty gorges, and then several edges of limestone and gritstone, the bands of the lower part of the Yoredale series, are crossed. The Tyne-bottom limestone of the White Force is 1730 feet above the sea-level, the Cronkley plateau rather higher. The fell stands out boldly towards the Tees from the main ridge of hill, so that from the White Force to the Caldron Snout the nearest way is across the back of it, and here we have those undulated patches of loosely granular metamorphosed Tyne-bottom limestone which botanists know so well, patches of white crumbling rock and wiry scraggy turf which easily catch the eye amidst the heather and peat. The following are the rarer plants of the fell-top, growing nearly all of them upon the "sugar limestone."

<i>Thalictrum alpinum</i>	<i>Primula farinosa</i> begins
<i>Draba incana</i>	<i>Plantago maritima</i>
<i>Helianthemum canum</i>	<i>Juniperus communis</i>
<i>Hippocrepis comosa</i>	<i>Tofieldia palustris</i>
<i>Dryas octopetala</i>	<i>Juncus triglumis</i> (planted)
<i>Galium commutatum</i>	<i>Elyna caricina</i>
<i>Gnaphalium dioicum</i>	<i>Carex capillaris</i>
<i>Gentiana verna</i>	<i>Lycopodium selaginoides</i>
<i>Vaccinium Oxycoccus</i>	<i>Grimmia Doniana</i>
<i>Bartsia alpina</i>	

The stream which flows from the back of Cronkley fell is joined by another little streamlet from the east, upon the banks of which, a short distance from their junction *Polygala austriaca* grows, and at the edge of the fell falls over a deep scar of Tyne-bottom limestone based upon Basalt. This is what is called the White Force. There is a way down from above to the centre of the waterfall, and on the west of it a deep perpendicular precipice, and upon each side the hills sweep round towards the force so as to form a sort of ravine, the lower part of which is almost blocked up by fallen debris. The following rarer plants grow here.

*Geranium lucidum* begins  
*Galium commutatum*  
     boreale  
*Hieracium anglicum*  
     iricum  
*Pyrola secunda*  
*Asplenium viride*  
*Andreæa Rothii*  
     alpina  
*Encalypta ciliata*

*Grimmia spiralis*  
     torta  
*Racomitrium protensum*  
*Zygodon Mougeotii*  
*Bryum Zierii*  
*Bartramia Cæderi*  
*Fissidens osmundoides*  
*Anactangium compactum*  
*Leskea subrufa*  
*Hypnum pulchellum.*

The edge of Cronkley fell for about a mile is girdled by a series of steep basaltic cliffs, which extend from the neighbourhood of the White Force westward to the spur of the hill which is opposite the termination of Falcon Clints. These are called Cronkley Scars. They are from one to two hundred feet in depth, as viewed from a distance the colour of mist or smoke-grey, made up of an infinite number of depressions and projections, and though the greenstone rock is seldom to be seen in masses of any considerable size, yet it is so much broken up and breaks away so easily, as to render it a somewhat dangerous exploit to climb amongst the steeper parts of them. Little streamlets trickle over the cliffs in several places, and the slope at the bottom of the scar is thickly strewn with debris. The following are the rarer plants of these scars, and of the open space beneath them, and adjacent river bank.

*Thalictrum alpinum*  
*Draba incana*  
*Geranium sylvaticum*  
*Potentilla fruticosa*  
     alpestris  
*Rubus saxatilis*  
*Epilobium angustifolium*  
*Peplis Portula*

*Ribes petræum*  
*Sedum purpureum*  
     villosum  
*Saxifraga aizoides*  
     stellaris  
     hypnoides  
*Galium boreale*  
*Hieracium iricum*

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*Hieracium pallidum*  
*Solidago Virgaurea*  
*Gentiana verna*  
*Arbutus Uva-ursi*  
*Bartsia alpina*  
*Littorella lacustris*  
*Polygonum viviparum*  
*Salix phylicifolia*  
*Habenaria albidia*  
*Elyna caricina*  
*Carex capillaris*  
*Sesleria cærulea*  
*Poa Parnellii*  
*Allosorus crispus*  
*Polypodium calcareum*  
*Asplenium viride*  
*Equisetum variegatum*  
*Andreaea alpina*  
     *Rothii*  
     *rupestris*

*Gymnostomum rupestre*  
     *microstomum*  
*Blindia acuta*  
*Cynodontium Bruntoni*  
*Dicranum falcatum*  
     *fuscescens*  
*Hedwigia ciliata*  
*Grimmia torta*  
*Racomitrium protensum*  
*Orthotrichum Drummondii*  
*Zygodon Mougeotii*  
*Bryum crudum*  
     *alpinum*  
     *Zierii*  
*Tetraplodon mnioides*  
*Fissidens osmundoides*  
*Leskea subrufa*  
*Hypnum Crista-castrisensis*  
     *exannulatum*  
     *pulchellum*

Opposite Cronkley the Tees receives a considerable stream from the north, which is called Langdon beck. Immediately below the mouth of this is the bridge by which access is obtained to the Yorkshire side of the river from the high road between Middleton and Alston. When the stream is low it is just possible to wade across it in this part, but under ordinary circumstances the attempt is not to be recommended. Below the bridge the river again sweeps round to the foot of the Yorkshire fells and upon the Durham side we have a repetition of Falcon Clints upon a smaller scale in Force garth scars. On the south side of the Tees the little stream of Blea beck forms a narrow steep glen through the Basalt, leaping from ledge to ledge, and overhung with moss-covered rocks, the brown moors sweeping from it on either side. And then comes the High Force. Here the main stream of the Tees, its waters contracted often into a single deep narrow channel, makes a sheer leap of 69 feet into a noble ravine, the cliffs of which margin the stream for a considerable distance below it. The cliff is dark coloured basalt, resting immediately upon dark coloured indurated shale, with limestone below it, and when the stream is full the water flows upon both sides of the massive angular crag which overlooks the main descent. On the Durham side of the river the slope is covered by a large plantation, consisting principally of spruce firs, and on the Yorkshire side the moors reach down to the edge of the cliffs. A more beautiful spot for a summer day's excursion than this ravine, with its

never-ending roar of waters, in front the cataract with its ceaseless rush and cloud of misty spray, at the bottom the dark foaming stream flowing rapidly amongst thickly strewn boulders and margined in the open space below the cliffs with a grove of fantastically shaped juniper bushes, shut in above by its wood-covered slope and girdle of dark crags, can scarcely be wished for. By the side of the high road at the top of the wood stands the High force Inn, with a fine view of the waterfall, over the tree tops, from its upper windows.

Between the High force and the Lune three streams of considerable size flow into the Tees from the north. The distance between the two points is about six miles and the fall in the stream about forty feet per mile. The river channel is now considerably deeper than it is above the High force, and especially during the first two miles the stream side is much undulated and its banks are often rocky and precipitous. There is a wooden bridge at Lower Cronkley, where the High force ravine opens out, and where the cliffs are steepest, about two miles below the High force, a chain bridge spans the river. This is called Winch bridge and in its neighbourhood are a series of fine rapids and upon the Durham side a fir plantation again skirts the river. Opposite Winch bridge the hills again recede from the river and from this point to the Lune they run parallel with it at a distance from it of about half a mile, leaving an open grassy and somewhat wooded space at the bottom of the dale. Above the village of Holwick the continuation of the Mickle fell ridge, which here is called Green fell, still reaches the Upper zone and below it is the wide grassy plateau of Holwick fell. From the High force the smoke-grey basaltic crags range along the edge of the gradually declining fells past Holwick and Unthank and only terminate a short distance before the Lune is reached. The following, in addition to some of those which have been already mentioned, are the rarer plants of Holwick Scars.

*Pyrus Aria*  
*Allosorus crispus*  
*Poa Parnellii*  
*Cynodontium Bruntoni*  
*Dicranum Blyttii*  
                   *fuscescens*  
*Grimmia torta*

*Diphyscium foliosum*  
*Bryum acuminatum*  
*Tetraplodon mnioides*  
*Hypnum heteropterum*  
                   *hamulosum*  
*Neckera pumila.*

The following are the rarer plants of the cliffs and fields by the stream-sides and the rocks in the bed of the river from the High force downward to the Lune, growing all of them in the first two miles and many of them also lower down.

<i>Thalictrum flexuosum</i>	<i>Asplenium viride</i>
<i>Stellaria nemorum</i>	<i>Equisetum umbrosum</i>
<i>Potentilla alpestris</i>	<i>variegatum</i>
<i>fruticosa</i>	<i>Lycopodium selaginoides</i>
<i>Rubus saxatilis</i>	<i>Sphagnum rubellum</i>
<i>Rosa Sabini</i>	<i>Gymnostomum rupestre</i>
<i>Epilobium angustifolium</i>	<i>curvirostrum</i>
<i>Sedum purpureum</i>	<i>Anodus Donianus</i>
<i>Peucedanum Ostruthium</i>	<i>Blindia acuta</i>
<i>Galium boreale</i>	<i>Dicranum rufescens</i>
<i>Crepis succisæfolia</i>	<i>fuscescens</i>
<i>Hieracium anglicum</i>	<i>Distichium capillaceum</i>
<i>iricum</i>	<i>Encalypta ciliata</i>
<i>pallidum</i>	<i>Grimmia torta</i>
<i>murorum</i>	<i>Orthotrichum rupestre</i>
<i>gothicum</i>	<i>Drummondii</i>
<i>crocatum</i>	<i>Zygodon Mougeotii</i>
<i>corymbosum</i>	<i>Diphyscium foliosum</i>
<i>Serratula tinctoria</i>	<i>Aulacomnion androgynum</i>
<i>Carduus heterophyllus</i>	<i>Bryum crudum</i>
<i>Bartsia alpina</i>	<i>alpinum</i>
<i>Melampyrum sylvaticum</i>	<i>pallescens</i>
<i>Plantago maritima</i>	<i>Zierii</i>
<i>Polygonum Bistorta</i>	<i>Messia uliginosa</i>
<i>viviparum</i>	<i>Bartramia Halleriana</i>
<i>Rumex aquaticus</i>	<i>Fissidens osmundoides</i>
<i>Salix purpurea</i>	<i>Anæctangium compactum</i>
<i>phylicifolia</i>	<i>Leskea Sprucei</i>
<i>Juniperus communis</i>	<i>subrufa</i>
<i>Habenaria albida</i>	<i>Hypnum incurvatum</i>
<i>Convallaria majalis</i>	<i>pulchellum</i>
<i>Melica nutans</i>	<i>Fontinalis squamosa</i>
<i>Poa Parnellii</i>	

At the Lune, which at its junction with the Tees is 700 feet above the sea-level, Upper Teesdale may be considered to terminate. Respecting the Geology of the tract almost all which it is necessary to say is contained in the Geological chapter. At the bottom of the upper part of the dale, forming the cliffs of Cronkley and those over which the river falls at the Caldron Snout is the great basaltic mass, which extends up Maze beck for a couple of miles and in an eastern direction occupies the bed of the stream as far as the High force. A little lower down it leaves the bed of the river and ranges along the southern slope of the dale almost as far as the Lune. The stratification of the sedimentary rocks is much disturbed and complicated by the four faults of which we have spoken and other of lesser



importance. From a floor of Basalt rises upwards the Mickle fell ridge, the Lower Mountain Limestone at the bottom, but the greater part of the slope made up of the Upper Mountain Limestone, which has patches of Millstone Grit over it in two places. From this ridge are downthrows towards Westmoreland and towards the east and lower down the dale a downthrow or steep dip towards the north, so that first the Lower and afterwards the Upper Mountain Limestone occupy the river-bed. And then comes the thousand feet fault which runs along the line of Lunedale, beyond which nothing is seen but the Millstone Grit till we reach the Greta.

The most noteworthy characteristic which Upper Teesdale presents from a botanical point of view is, that it furnishes several Montane rarities which as growing there are separated more or less conspicuously from the other localities in which they occur. Restricting ourselves to the Flowering Plants of the Yorkshire side of the river the following are the species which furnish the most striking instances of this exceptionality. *Polygala austriaca*, a species diffused upon the Continent from Scandinavia southward to Italy and Transylvania is not known elsewhere in Britain. *Potentilla fruticosa* and *Gentiana verna*, both of which are abundant in Teesdale and both widely diffused upon the Continent, grow in the West of Ireland and sparingly in the Lake district, but are not known elsewhere in Britain. *Bartsia alpina* grows in Craven and the Lake district and from thence leaps to the East Highlands. *Elyna caricina* is like the *Bartsia*, except that it is not known in Craven. *Myosotis alpestris* and *Tofieldia palustris* from Teesdale leap to Perthshire; and *Hieracium iricum* and *Carex capillaris* are also not known elsewhere in England and leap from Teesdale to the hills of Dumfries-shire.

The Lune rises upon the edge of the county and the southern slope of Mickelfell and runs due east along the edge of the fault for seven miles. Lunedale at its upper part is a broadly undulated hollow with a good road at the bottom, but with very few houses and with its slopes upon either side but little diversified by cliffs. The streamlet which flows from the east end of the Mickelfell ridge forms a small waterfall over a gritstone edge and runs through a lonely mountain tarn about half a mile in circumference, upon the banks of which grow *Ranunculus cœnosus*, *Allosorus crispus*, *Mnium subglobosum*, *Hypnum stramineum* and *H. exannulatum*. Passing Howgill and the dark Scotch fir plantations of Wemmergill, which latter runs up to the south slope of Green fell, three miles from the junction of the Lune with the Tees the fault crosses it and continues along the south side of the dale till it opens out into Teesdale. On

the Durham side of the Tees opposite Lunedale is Middleton, the mining capital of the dale. South of the fault is a wide surface of moorland country of the eugeogenous type of character. Its two principal dales are Balderdale and Deepdale, both of which have pleasant rocky stream channels and thick woods in their lower parts, but open out soon after the Middle zone is reached into broad spreading moorland glens. Kelton fell, upon the western edge of the county between Lunedale and Balderdale, almost or quite attains the Upper zone. At the foot of its slope towards the Tees are Mickleton and Romalldkirk, the latter the old centre of population for the upper part of the dale. At the junction of the Black beck and the Balder is the long-known station for *Saxifraga Hirculus*. Near the junction of the Balder with the Tees is the pleasant straggling village of Cotherstone. The following are the rarer plants of the woods and stream channel of the lower part of Balderdale.

*Euonymus europæus*  
*Ribes petraeum*  
*Sedum villosum*  
*Hieracium murorum*  
*Lathrea squamaria*

*Atropa Belladonna*  
*Gagea lutea*  
*Orthotrichum rivulare*  
*Hypnum depressum.*

South of the Balder the moorland bears the general name of Stainmoor, and Goldsborough, a broad topped angular peak with edges of Middle Gritstone, which is under 500 yards above the sea-level, is conspicuous. "Deepdale's solitude\*" is broken now by the rush over it, six times a day, of railway passenger trains not to speak of goods trains, and volunteer rifle shooting in addition. Deepdale is a deep narrow glen, with waterfalls over gritstone edges in the upper part of it, and thick woods with abundance of the beautiful Silver fir planted amongst them and a profusion of Wild Strawberries and Brambles. There is a huge erratic boulder of Shap fell granite in the bed of the stream not far from the Tees which is well worthy of a visit. Nowhere in North Yorkshire have we a more massive edge of gritstone than at Cat castle and from an elevated rocky seat overhung by rowan and birch trees there is a charming view of the fairy-like viaduct, iron girders throughout and 175 feet from ledge to basement, by which the railway spans the glen, and of the undulated country round about Barnard Castle, with a background of Durham hills. The following are the rarer plants which Deepdale furnishes:

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\* "In Deepdale's solitude to lie,  
 Where all is cliff and copse and sky ;  
 To climb Cat castle's dizzy peak,  
 Or lone Pendragon's mound to seek."

SCOTT.

*Corydalis claviculata*  
*Rubus Guntheri*  
*saxatilis*  
*Ribes petraeum*  
*Crepis succisæfolia*  
*Hieracium gothicum*

*Origanum vulgare*  
*Hordeum sylvaticum*  
*Asplenium viride*  
*Cynodontium Bruntoni*  
*Tetraphis pellucida*  
*Hypnum elegans.*

This railway, the South Durham and Lancashire line, has a fine viaduct over the Tees upon stone arches, and runs up the Stainmoor slope, past Bowes and over the Pennine ridge at the lowest part of the Stainmoor hollow, which is under 500 yards above the sea-level. Where it crosses the moors there are fine views from it of Mickle fell and Cross fell upon the north and on the south of Water Crag and the Arkendale peaks. Scott's oft-quoted lines describe this part of the country as viewed by a sentinel from the turret of the castle at Barnard Castle.

“ Far in the chambers of the west,  
 The gale had sigh'd itself to rest ;  
 The moon was cloudless now and clear,  
 But pale and soon to disappear ;  
 The thin grey clouds wax'd dimly light  
 On Brusleton and Houghton height :  
 And the rich dale that eastward lay  
 Waited the wakening touch of day  
 To give its woods and cultured plain  
 And towers and spires to light again.  
 But westward Stainmoor's shapeless swell,  
 And Lunedale wild and Kelton fell,  
 And rock-begirdled Gilmanscar,  
 And Arkengarth, lay dark afar.  
 While as a livelier twilight falls,  
 Emerge proud Barnard's banner'd walls,  
 High crown'd he sits, in dawning pale,  
 The sovereign of that lovely vale.

• • • • •  
 What prospects, from his watch-tower high,  
 Gleam gradual on the warder's eye,  
 Far sweeping to the east he sees  
 Down his deep woods the course of Tees,  
 And tracks his wanderings by the steam  
 Of summer vapours from the stream.

• • • • •  
 Nor Tees alone, in dawning bright,  
 Shall rush upon his ravish'd sight,

But many a tributary stream  
 Each from its own dark dell shall gleam;  
 Staindrop, who from her sylvan bowers  
 Salutes proud Raby's battl'd towers,  
 The rural brook of Eglestone,  
 And Balder, nam'd from Odin's son,  
 And Greta, to whose banks ere long  
 We lead the lovers of the song,  
 And silver Lune, from Stainmoor wild,  
 And fairy Thorsgill's murmuring child,  
 And last and least but loveliest still  
 Romantic Deepdale's slender rill."

Next comes Thorsgill, a small wooded glen on the very edge of the gritstone, with the ruins of Eglestone Abbey upon the edge of it very near the junction of the stream with the Tees. Scott's description of this glen and that of the last half mile of the course of the Greta have already been quoted (see page 73.) The Greta is the last of the branches of the Tees which have their rise amongst the moorlands. From the lowest point of the Pennine escarpment there is a rise of 700 feet to the summit of drainage on the south and from the four miles of moorland during which this rise takes place the numerous branches of the stream are supplied. The total length of Gretadale is about fifteen miles and the course of the stream is due east. From Water Crag and Mirk fell we look northward over a broadly undulated hollow with Kelton fell and Mickle fell in the back ground, so wild and dreary that the passing trains look strangely out of place, the two "Spitals" at the upper part of Gretadale shining out like green oases in a desert of brown moor. Below Sleightholme the southern fork of the Greta forms a fine waterfall over the Main Limestone, in the neighbourhood of which grow *Ranunculus canosus*, *Sedum villosum*, *Poa nemoralis* and *Gymnostomum rupestre*. Two miles above Bowes the principal branch of the stream is spanned by a natural arch of Main Limestone which bears the name of God's bridge, and for some distance below it the stream is usually swallowed up, like the Dove and Bran by the Middle Oolite. On the south side of the dale the Main Limestone girdles the edge of a steep moor past Hope and Barningham,\* beneath a

\* "The scenery whose influence I can trace most definitely throughout his works, varied as they are, is that of Yorkshire: of all his drawings I think that of the Yorkshire series have most heart in them, the most affectionate, simple, unwearied, serious finishing of truth. • • His first conceptions of mountain scenery seem to have been taken from Yorkshire, and its rounded hills, far winding rivers and broken limestone scars to have formed a type in his mind to which he sought, so far as might be obtained, some correspondent imagery in other landscapes. Hence he almost always pre-

rounded swell of gritstone which sweeps away from the top of it to the summit of the ridge, till at last, at the junction of the Greta with the Tees at Rokeby, 380 feet above the sea, we have the limestone down again to the level of the river. The finest piece of cliff is at Gilmansear, opposite Bowes, a station for *Draba incana*, *Saxifraga hypnoides* and *Leskea subru- fa*. The lowest strata of the dale are those of the bed of the river at Rutherford bridge. Below Brignal and Scargill the stream runs in a deep glen, with flagstone quarries and steep woods. Rokeby, with its rocky river channel and thick woods and limestone scars, with Mortham's Tower and Fitz-Hugh's tomb on the crest of the southern slope, and the charming Dairy bridge, and the steep sylvan bank of the Tees where it breaks through the limestone immediately beneath the Abbey bridge, should be visited by all tourists. The following are the rarer plants of these stations :

*Stellaria nemorum*  
*Astragalus glycyphyllos*  
*Vicia sylvatica*  
*Epilobium angustifolium*  
*Rubus saxatilis*  
*Ribes petraeum*  
*Lathraea squamaria*  
*Lamium Galeobdolon*  
*Taxus baccata*

*Gagea lutea*  
*Distichium capillaceum*  
*Grimmia trichophylla*  
*Orthotrichum Hutchinsiae*  
*Zygodon Mougeotii*  
*Bryum obeonicum*  
*Mnium cuspidatum*  
*Anomodon longifolius*  
*Leskea Sprucei*

From the Greta eastward to the district boundary is a tract of undulated low country, with a good deal of wood and generally a strong clayey soil, which altogether occupies something under a quarter of the whole district. It has no town in it or village of any considerable size and does not any-

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ferred to have a precipice *low down* upon the hillside, rather than near the top : liked an extent of rounded slope above and the vertical cliff to water and valley better than the slope at the bottom and the wall at the top, and had his attention early directed to those horizontal, or comparatively horizontal beds of rock which usually form the face of the precipices in the Yorkshire dales, not, as in the Matterhorn, merely indicated by veined colouring on the surface of the smooth cliff, but projecting or mouldering away in definite succession of ledges, cornices and steps. . . . Other artists are led away by foreign sublimities and distant interests, delighting always in that which is most markedly strange and quaintly contrary to the scenery of their own homes. But Turner evidently felt that the claims upon his regard possessed by those places which first had opened to him the joy and the labour of his life could never be superseded. No alpine cloud could efface, no Italian sunbeam outshine the memory of the pleasant dales and days of Rokeby and Bolton : and many a simple promontory dim with southern olive, many a lone cliff that stooped unnoticed over some alien wave, was recorded by him with a love and a delicate care that were the shadows of old thoughts and long-lost delights whose charm yet hung like morning mist above the chanting waves of Wharfe and Greta."

RUSKIN.

where exceed five miles in breadth from north to south. A little stream which rises in the low country not far from the Greta flows due east and enters the Tees at Croft. The limestone sweeps obscurely round the upper part of its hollow and the remainder of the surface is mainly occupied, on the west by the Millstone Grit and on the east by the New Red Sandstone. At Pierse bridge the Magnesian Limestone, which comes out in strong force upon the north of the river, just shews itself in a cliff by the Tees side. Here grow *Anemone Pulsatilla*, *Helleborus viridis*, *Sambucus Ebulus* and *Stachys ambigua*. From Pierse bridge to Croft an embankment sweeps along by the riverside, sometimes coming up to the waters edge and sometimes retreating from it for a short space upon which, where it is dry and sandy, grow *Rosa Sabini*, *Scabiosa columbaria*, *Picris hieracioides* and *Origanum vulgare*. At a distance of about a mile from the Tees at Stapleton is situated upon the Durham side of the river the town of Darlington. By the side of the Tees in the Central Valley *Scirpus pauciflorus* and *Stellaria nemorum* occur and there is abundance of *Myrrhis odorata*, and some of the Montane rarities which grow about the upper part of the river, as for instance *Gentiana verna*, *Galium boreale* and *Plantago maritima*, may occasionally be seen to establish themselves for a while. Halnaby Carr, a small piece of wooded swampy ground about a mile from Croft by the side of the road to Richmond, is a good botanical locality. It yields *Ranunculus Lingua*, *Pyrola rotundifolia*, *Listera cordata*, *Carex teretiuscula*, *C. stricta*, *Eriophorum gracile*, *Hypnum stramineum* and abundance of *H. Blandovii* and *H. nitens*, and in an adjacent lane is a station for *Juncus diffusus*.

The ascertained flora of this district is decidedly below that of five of the others. Of the Montane species it has 77 out of 85, which is considerably more than any of the others can furnish, but the Montane is the sole category in which it can claim a superiority. Its Xerophilous species are neither so numerous nor so abundant as in the West Swale, Yore and Derwent districts. Of the submaritime species it has one only; its Hygrophilous plants are very few in number and rare; and its Rarer ascending considerably under the average number. The following is an analytical table of its flora;

**GEOGRAPHICAL ANALYSIS OF THE FLORA OF THE WEST TEES DISTRICT.  
AREA 190 SQUARE MILES.**

CATEGORY.	Number of species.	Per centage of total native flora.
1 Montane species .. ..	77	13
2 Xerophilous „ .. ..	33	6
3 Maritime „ .. ..	1	—
4 Hygrophilous .. ..	15	3
5 General ascending species	351	61
5 Scattered ascending „	102	18
7 Local ascending „	5	1
8 Colonists .. ..	36	
9 Denizens .. ..	18	
Total number of the species.	629	

## CHAPTER VII.

### NO. 7. THE YORE DISTRICT.

The upper part of Wensleydale is very different from that of either Teesdale or Swaledale. In Teesdale there is no highroad on the Yorkshire side of the river westward of Holwick and on the Durham side that which runs between Middleton and Alston leaves the neighbourhood of the Tees not far above the High force and turns towards the north to cross the summit of drainage. Higher than this there is nothing to be seen during the ten miles which intervene before the low country at the foot of the great Pennine escarpment can be reached but a single farm house and a nobleman's shooting box, surrounded by crags and streams and the wide waste of trackless moorland over which Micklefell and Crossfell reign supreme. Swaledale is hemmed in and isolated by its guardian crescent of high undulated peaks and the way out at the dale head is by a lonely little road which winds between them over a steep mountain pass 1700 feet in elevation. But Wensleydale, even at its upper part, is a broad open hollow, with good highways leading out of it in three different directions into Mallerstang, Garsdale and Ribblesdale over passes the ascent to which is very gradual and the highest of which does not attain 450 yards above the sea-level.

The Eden for a very short but very interesting portion of its early course is the county boundary. The three streams, Eden, Swale and Yore, all rise within a short distance of one another amongst the group of hills to which the crescent peaks of Swaledale belong. Beneath these on the west is a broad open hollow, with a group of dark rugged hills rising abruptly upon the opposite side of it, of which Wild Boar fell (2327 feet) is the highest, but none of which belong to the North Riding. To the north stretches the gradually widening glen of the Eden (Mallerstang), to the



south that of the Yore (Wensleydale). The Eden is a mere mountain rivulet till it has descended from the fells into the hollow, and then, with an undulated sweep of ordinary grassy heathery moorland all around, it plunges suddenly into what is called Hell gill, in some respects certainly the most remarkable glen which our field of study has to shew. From the very edge of the water upon both sides limestone precipices, to a height of fifty feet, rise so sheerly and abruptly, that in one place, with the maddened mountain torrent foaming and boiling at a depth of fifty feet beneath their edges, it is easy to leap across from one crag to the other. The length of the ravine is under a quarter of a mile and in it the stream declines rapidly in level. The cliffs are over-grown in many places by mosses and bushes, but the recesses of the glen it is almost impossible to explore without a rope, for its sides are much too steep to be climbed, and there is nothing at the bottom but the mere stream channel, and not very far from its opening there is a pool of dark peat-stained water a couple of yards in depth, into which if a luckless mountain sheep fall, woe betide it. The rarer plants of the glen are *Draba incana*, *Hieracium murorum*, *Asplenium viride*, *Gymnostomum rupestre*, and *Bartramia Oederi*.

The Yore runs down into the hollow from the peaks at a very short distance from the Eden and nearly parallel with it. From the Shaw Paddock Inn, which stands by the side of the high road at a distance of not much more than a mile from Hell gill, it flows for six miles towards the south east. Here it increases rapidly and from the moors upon both sides of the hollow little streams join it at very short intervals. On the east we have a long unbroken ridge, called Cotter fell, which attains 2186 feet at its culminating point. Upon the east side of this ridge is Cotterdale, a dale with two long branches which stretch up far amongst the moors in the direction of Shunnor Fell. In one of the ravines there is a waterfall, with a curious little cavern in the limestone, about which *Epilobium angustifolium* and *Hypnum pulchellum* grow. There is also a fine sylvan waterfall upon the Cotter not far from its junction with the Yore. And upon the south we have Mossdale, also with waterfalls, where grow *Meconopsis cambrica*, *Meum athamanticum*, *Encalypta ciliata*, *Bryum crudum* and *Bartramia Oederi*.

At Apperset bridge *Ceterach officinarum* grows. Here Widdale beck from the south-west joins the Yore upon almost equal terms and from this point downwards it is a considerable stream. Along the west side of Widdale stretches a long high ridge of moorland, bare and grassy and towering upwards with wall-like abruptness, of which the peak attains

2203 feet. The Main Limestone scars which girdle it and the limestone pavement of the hill-top have been mentioned already and will often be referred to, along with the similar pavement of Cam fell, in speaking of the ascending limits of plants. A rounded mass of hill called Woe fell (1829 feet) stands at the point of junction of Widdale, Dentdale and Ribblesdale. Widdale has two branches, Widdale proper and Snaizholme, both bare and grassy and both with steep grassy banks the monotony of which scars of limestone sometimes pleasantly relieve. The high and wall-like western ridge is fully three miles in length and forms the background of most of the views from the lower part of Wensleydale. The following are the rarer plants of Widdale ;

*Draba incana*  
*Rubus saxatilis*  
*Sedum villosum*  
*Galium sylvestre*  
*Asplenium viride*

*Lycopodium selaginoides*  
*Orthotrichum Drummondii*  
*Bryum Zierii*  
*Mnium affine*  
*subglobosum*

The little town of Hawes stands at an elevation of from 800 to 900 feet above the sea level within a mile of the point where Widdale beck joins the main stream of Yore. Seven dales, on the north Mossdale, Yoredale proper, Cotterdale and Fossdale, on the south Widdale, Gale dale and Seamerdale, all open out within three miles of Hawes, radiating from it towards the west, north and south. From Hawes due east to Leyburn extends the main Wensleydale hollow, fifteen miles in length, a noble dale, broad and steep, the stream at the upper part at least 1400 feet below the hill-tops, the sides of the dale girdled by long lines of limestone scar, with little villages at the bottom succeeding each other at short intervals, surrounded by pastures and rich luxuriant meadows.

The north side of the dale is much more continuous and less broken than the south, its streams being shorter and its branch dales narrower and less deeply excavated. Next to Cotterdale comes Fossdale. Its two branches extend for a considerable distance into the moors, and then the two becks unite to form a stream which from their junction falls rapidly amongst thick woods, and at last not far from the Yore throws itself over a precipice 99 feet in depth, and forms that gem of the Yoredale waterfalls, Hardraw force. The cap rock of the fall is the Hardraw Limestone, which also forms scars round the edge of the glen which leads up to it, and this is based upon shale, the limestone projecting so much beyond the shale that it is often quite practicable to pass between the spout of water

and the bottom of the rock, though it is at the risk of being drenched by the cloud of spray which surrounds it. The following are the rarer plants of the cliffs and woods of Fossdale and of this Hardraw ravine ;

<i>Aquilegia vulgaris</i>	<i>Salix nigricans</i>
<i>Hutchinsia petræa</i>	<i>Poa nemoralis</i>
<i>Draba incana</i>	<i>Asplenium virido</i>
<i>Stellaria nemorum</i>	<i>Gymnostomum rupestre</i>
<i>Rubus saxatilis</i>	<i>curvirostrum</i>
<i>Ribes alpinum</i>	<i>Zygodon Mougeotii</i>
<i>Hieracium murorum</i>	<i>Leskea subrufa</i>
<i>crocatum</i>	<i>Hypnum glareosum</i>
<i>corymbosum</i>	

The top of Fossdale is coincident with the head of the stream which falls into the Swale from the south-west at Muker. Along the edge of the two glens runs the road which leads across the moors from Muker to Hawes. The pass is called the Buttertubs pass. On the west of it rises the huge bulk of Shunnor fell, and on the opposite side Lovely Seat stands boldly out against it, the summit of the hill being fully 500 feet above the highest point of the pass. This last is perhaps the most conveniently situated of all the hills of the district for giving a panoramic view of the upper part of the Swaledale and Yoredale hollows and it commands also a sight of the peaks of Whernside and Ingleborough.

From the Lovely Seat peak eastward along the watershed the ridge reaches the Upper zone for at least a mile, and on the edge of Yoredale immediately over Sedbusk Stag's fell attains 1756 feet. The next glen is called Skellgill and is a narrow, uninhabited, somewhat rocky gill which runs from north-west to south-east and yields *Ranunculus cœnosus* and *Bryum alpinum*. At the little town of Askrigg a very interesting glen, also from the north-west, pours its waters into the Yore. This is called Whitfell gill and lower down Mill gill, and contains four waterfalls of great beauty, two of which are of considerable depth. Its two branches run at first for about a couple of miles in undulated moorland hollows and then they unite. Immediately beneath the peak of Whitfell, (1691 feet) with its limestone precipices, and perhaps the most elevated natural wood of any considerable size which we have anywhere in North Yorkshire, the stream begins rapidly to descend and soon the first force is reached, consisting of a series of rapids of which the principal fall is not above twenty feet in depth. The next waterfall, Whitfell force, is much broader and deeper, and the rocky river banks, covered and surrounded by dense woods,

rise steeply from it on both sides. The two other waterfalls are only a very short distance from the town, Millgill force, the finest of the two, being a noble fall over a limestone precipice 69 feet in depth, which is approached by a wooded and rocky glen. The following are the rarer plants of this gill ;

*Actæa spicata*  
*Stellaria nemorum*  
*Ribes petraeum*  
*Hieracium crocatum*

*Hieracium prenanthoides*  
*Polygonum viviparum*  
*Habenaria albida*  
*Orthotrichum Drummondii*

From Askrigg to Carperby the hills stand boldly out towards the stream. There is along their edge an almost continuous line of the scars of the Upper Limestone and the highroad for a considerable distance runs along the summit of a wooded scar of Lower Limestone not far from the water's edge. At Woodhall are extensive lead mines, the stream which runs from them being thickly lined with *Armeria maritima* down to its junction with the Yore. The elevation of the highest point where it here grows scarcely exceeds 250 yards. I have not seen the plant elsewhere in an inland station except at a much greater altitude amongst the mountains, as for instance at the head of the Whey Sike in Teesdale and upon the crags of Twll Du and Crib-y-ddesgil in Snowdonia, but here it is to be met with in the greatest luxuriance and profusion. *Thlaspi occitanum* grows sparingly along with it and *Scrophularia Ehrharti* by the roadside not far distant. Past Carperby the dale widens and the hills decline in altitude. Above Redmire the ruins of the old castle of Bolton occupy a prominent position upon the hillslope. Then comes Preston, with its scar and lead mines, with abundance of *Arenaria verna* and *Viola lutea* : and beneath it, at the bottom of the hollow, stands Bolton Hall, surrounded with woods, and near it the little village of Wensley, which gives its name to the dale.

From the edge of the moor above Wensley runs a long continuous gradually-declining scar of Main Limestone which is called Leyburn Shawl. The railway now reaches Leyburn, so that this point is brought within the compass of an easy day's excursion from Thirsk or York. The hillslope below the cliff is covered with a dense wood, over which beautiful views may be obtained of the great Wensleydale hollow, and of Penhill and the branching sylvan dales which run up behind it and past it on the south ; and above the scar upwards to the watershed ridge stretch the Millstone Grit beds of the hill summits, with extensive flagstone workings excavated amongst them. The following plants grow either upon the Shawl or amongst the debris of the quarries ;

*Teesdalia nudicaulis*  
*Arenaria tenuifolia*  
*Linum perenne*  
*Euonymus europæus*  
*Trifolium striatum*

*Vicia sylvatica*  
*Galium sylvestre*  
*Orobancha rubra*  
*Festuca pseudo-myurus*

We must now return to Hawes and take the south side of the dale. In this direction, as stated before, the branch dales are broader, deeper and altogether more important than those of the north side of the river. Along the line of watershed on the south the ridge of hill which separates Yoredale from Wharfedale scarcely declines anywhere from the head of Widdale eastward to the peak of Great Whernside, a distance of at least ten miles in a straight line, below the limit of the Upper zone and along the whole length of this ridge the Main Limestone reaches a height of 600 or 650 yards.

The ridge which bounds Widdale on the east culminates in the peak of Dodfell, 2189 feet in height, with a cap of gritstone nearly 300 feet in thickness over the Main Limestone. The slope of this hill is very little diversified by rock, and the ascent is easy and the view from the summit very fine. On the north is Hawes and the broad branching Wensleydale hollow with Lovely Seat and the woods of Hardraw in the back ground. East and west, immediately beneath the ridge, their streams 1000 feet below it, are Widdale and Galedale. Dodfell forms one corner of a square of which Whernside, Ingleborough and Pennyghent are the other three corners and towards the south we have Cam fell with its limestone pavement, wild and dreary Langstrothdale and the upper waters of the Wharfe, and farther towards the south and west is outspread a wide surface of moorland country in which the three peaks which have just been named are the most conspicuous objects. The Galedale stream runs through Hawes and has a fine waterfall upon it two miles from the Yore, a broad spreading fall from thirty to forty feet in depth over limestone based upon shale, with steep wooded shaly banks upon both sides of the stream for some distance below it. The next ridge has the gritstone over the mountain limestone in one place only, and that is within two miles of Hawes, in the peak of Wetherfell, or as it is sometimes called, Bears head, 2015 feet in altitude. Seamerdale is unique amongst the North Yorkshire dales in its shape and character. The hills that on each side guard its entrance stand boldly out towards the Yore, especially Addleborough, at the termination of the boundary ridge on the east, a square-topped hill 1564 feet in altitude, which is crested by crags of the Underset limestone and forms

a conspicuous object from the lower part of Wensleydale. At the bottom of Seamerdale stands the village of Bainbridge and its stream is sometimes called the Bain. Two miles from the Yore is a lake which measures between two and three miles in circuit, which is called Seamer Water, and which is the only lake of even a moderate size of which North Yorkshire can boast. Bare steep grassy hills rise with much abruptness from its eastern and western shores, and beyond the lake there is a little village with a rustic church, and broad branching glens with woods and scattered farm-houses, and numerous gills which penetrate into the recesses of a long steep limestone ridge which runs like a wall along the line of watershed on the south. The rarer plants of the lake-side and surrounding crags are

*Ranunculus Lingua*  
*Hutchinsia petræa*  
*Draba incana*  
*Potentilla verna*  
*Hippuris vulgaris*  
*Sedum villosum*  
*Peucedanum Ostruthium*  
*Lathrea squamaria*  
*Plantago maritima*

*Polygonum viviparum*  
*Juncus diffusus*  
*Sesleria cærulea*  
*Lycopodium selaginoides*  
*Encalypta ciliata*  
*Bryum elongatum*  
*Zierii*  
*Hypnum lycopodioides*

From Hawes past Bainbridge and Askrigg the fall of the main stream of the Yore is very gradual, when the elevation above the sea-level of its bed is considered. At Aysgarth, in a deeply excavated rocky channel with a wooded bank rising steeply from it upon either side, it begins to form a series of picturesque rapids which are continued for about a mile. Fed by the waters of the wide-branching dales which one after another have poured their contributions into it, the stream is now a fine river. Margined by the long winding scars of the Lower Mountain Limestone and interpolated plate beds it flows down this pleasant Aysgarth glen, its dark peat-stained waters hemmed in upon both sides by shelving reaches of moss-fringed grey limestone rock, and above them there rises a steep bank covered thickly with aboriginal trees and brushwood, hazel, white-thorn, brambles and roses of multiform specific types, and on the south are the broad heathery slopes of Penhill, its peak 1200 feet above the stream. The main fall, which is over a limestone precipice about 20 feet in depth, is exceedingly fine in the impression of irresistible force which it gives when the river is swollen as full as it was the last time that I visited the spot. The following are the rarer plants of the glen;

*Aquilegia vulgaris*  
*Euonymus europæus*  
*Hippocrepis comosa*  
*Rubus saxatilis*  
*Galium sylvestre*  
*Hieracium murorum*  
     *cæsius*  
     *tridentatum*  
*Lithospermum officinale*  
*Polygonum viviparum*

*Daphne Mezereum*  
*Ophrys apifera*  
     *muscifera*  
*Allium Scorodoprasum*  
*Eriophorum latifolium*  
*Sesleria cærulea*  
*Melica nutans*  
*Lycopodium selaginoides*  
*Distichium capillaceum*  
*Hypnum fluviatile*

The next three dales, Bishopdale, Waldendale and Coverdale, are very similar to one another in character. They are long narrow dales, with a considerable quantity of wood in their lower parts, their sides steep and grassy and often crested or girdled by limestone cliffs and they are each terminated by a steep narrow neck of land on the line of the watershed ridge. Southward from Addleborough along the ridge between Seamerdale and Bishopdale a broad surface of moorland culminates in Stake fell (1843 feet.) Opposite the head of Bishopdale and Waldendale and immediately upon the edge of Wharfedale Buckden Pike attains 2302 feet and the ridge which runs from it as a spur towards the north-east and separates the two last mentioned dales from one another attains 1876 feet in Wasset fell. This Wasset fell spur ceases at a considerable distance from the Yore, leaving a broad open well wooded hollow in which are the villages of Thoraby and West Burton, and the two streams unite a mile above where they join the main river. The rarer plants of the woods and crags and fields of these two dales are

*Draba incana*  
*Potentilla alpestris*  
*Peucedanum Ostruthium*  
*Galium sylvestre*  
*Hieracium cæsius*  
*Atropa Belladonna*  
*Mentha sylvestris*  
*Habenaria albida*  
*Ophrys apifera*

*Ophrys muscifera*  
*Allium Scorodoprasum*  
*Eriophorum latifolium*  
*Sesleria cærulea*  
*Polypodium calcareum*  
*Allosorus crispus*  
*Asplenium viride*  
*Encalypta ciliata*  
*Bryum Zierii*

Pursuing our course still further towards the east we come next to the ridge which separates Waldendale from Coverdale. It runs from Buckden Pike towards the north-east and terminates in Penhill (1817 feet), a fine broad massive heathery fell which stands boldly out into the main dale of Yore and forms a very conspicuous object in the view from Leyburn and

the Vale of Mowbray. Coverdale is twelve miles in length, its upper part being guarded by high hills upon both sides. Opposite Buckden Pike there is Great Whernside\* (2310 feet), an undulated grassy hill which commands beautiful views down Wharfedale and Nidderdale and over the lower summits to the east of it and across the Vale of York. This peak is the termination on the east of the long ridge of high moor that runs along the line of watershed between Yore and Wharfe and upon its eastward slope the Nidd has its source; and looking from Thirsk westward it is the highest point upon the line of the horizon. From Great Whernside and Little Whernside (1985 feet) the peaks decline gradually along the ridge towards the north-east, Rover Crag, which guards the entrance to the dale opposite Penhill, being 1552 feet in elevation. The ground about the lower part of the course of the Cover is open and well-wooded. The town and massive old castle at Middleham stand upon the slope of a spur of Penhill not far from the junction of the Cover with the Yore. The following are the rarer plants of the dale;

*Astragalus glycyphyllos*  
*Epilobium angustifolium*  
*Sedum villosum*  
*Cotyledon Umbilicus*  
*Galium sylvestre*  
*Salix phylicifolia*  
*Ophrys muscifera*  
*Allium Scorodoprasum*  
*Allosorus crispus*  
*Asplenium viride*

*Lycopodium selaginoides*  
*Andræa Rothii*  
*Dicranum fuscescens*  
*Oligotrichum hercynicum*  
*Orthotrichum Drummondii*  
*Tetrodontium Brownianum*  
*Bryum Zierii*  
*Bartramia Cederi*  
*Leskea subrufa*

As we have now reached the point at which Wensleydale is usually considered to terminate, a brief general sketch of its geology may suitably be here introduced. From Hawes eastward as far as Redmire we have the Lower Mountain Limestone occupying the bottom of the dale, rather more than 200 feet of its upper beds being altogether exposed. Over these are the strata of the Yoredale series, at the upper part of the dale 970 feet in thickness, five thick bands of limestone with still thicker interpolations of non-calcareous material, the strata answering to each other upon the slope of the opposite hills from south to north with but trifling difference in level. Along the ridge of watershed from the head of Widdale eastward

\* This must not be confounded with the better known Craven Whernside, which is due north of Ingleborough and south-west of Hawes.



to the head of Bishopdale the surface of the Upper or Main band of the Yoredale limestones attains an elevation of from 1900 to 1950 feet. Between the head of Bishopdale and the Wharfedale side of Great Whernside the summit of the series sinks to 1700 feet and its thickness becomes very much diminished, principally by the obliteration of its upper beds. In the immediate neighbourhood of Hawes we have the Main Limestone at an elevation of about 1800 feet on the south side and of about 1700 feet on the north side of the dale: and as we go down the dale it declines gradually in level. It reaches 1100 feet on the east side of Penhill, 850 feet in Middleham Moor, 700 feet at Leyburn, and sinks to 400 feet at East Witton. And above the strata of these two sets of Mountain Limestone beds we have the beds of the Millstone Grit series forming the cap-rock of many of the summits, and reaching their greatest thickness, that is to say, with most of the bands not disintegrated away, in Great Whernside, Penhill and Lovely Seat.

East of Leyburn the moorlands cease and the district which the Yore drains on the north becomes still narrower than before. On the south side of the river we have now an undulated moorland gritstone country, sloping suddenly towards the east, and penetrated by a eugeogenous dale, the stream of which runs from west to east and has numerous branches. It is about ten miles in length and the dale is called Colsterdale. The town of Masham stands upon the banks of its stream not far from the point where it joins the Yore, the latter being here 250 feet above the sea-level, and the top of the ridge which separates Colsterdale from Coverdale being upwards of 1500 feet above it.

From Leyburn to its junction with the Swale the Yore has a course of nearly thirty miles and through the low country it runs with many windings in a south-eastern direction. Soon after it has passed Masham it becomes the boundary of the North Riding on the south. The gritstone still continues along the banks of the river as far as Tanfield, through the woods opposite the pleasant undulated sylvan grounds of Hackfall. On the north side of the stream we have here *Viola sepincola*, *Bryum uliginosum* and *Hypnum pratense*. A tract of Magnesian Limestone bounds the Gritstone on the east, the beds of which extend from Thornton Watlass past Well and Nosterfield, and form a narrow terrace, which, although it scarcely attains anywhere an altitude above the sea level of 100 yards, yet has something of a slope in the direction of the dip of its beds towards the Central Valley. The limestone rocks form rapids in the bed of the stream below Tanfield bridge, and margin its northern bank with low

cliffs for a short distance. This little tract of Magnesian Limestone, here as southwards, produces several interesting plants, especially of the Xerophilous category, of which the following seem to be the most noteworthy ;

<i>Helleborus viridis</i>	<i>Lithospermum officinale</i>
<i>Astragalus glycyphyllos</i>	<i>Salix rubra</i>
<i>Onobrychis sativa</i>	<i>Epipactis ovalis</i>
<i>Spiræa Filipendula</i>	<i>Orchis pyramidalis</i>
<i>Caucalis daucoides</i>	<i>Ophrys apifera</i>
<i>Hieracium murorum</i>	<i>          muscifera</i>
<i>          cæsium</i>	<i>Bromus erectus</i>
<i>Campanula glomerata</i>	<i>Aulacomnion androgynum</i>
<i>Specularia hybrida</i>	<i>Bryum pallescens</i>
<i>Salvia verbenaca</i>	<i>          cernuum</i>
<i>Calamintha Acinos</i>	<i>Hypnum fluviatile</i>
<i>          Nepeta</i>	<i>          irriguum</i>
<i>          officinalis</i>	

The remaining portion of the district belongs to the Central Valley. The stream is the boundary of the Riding and the tract which it drains on the north varies from two to four miles in width. The city of Ripon stands upon the edge of the Magnesian Limestone not far from the river immediately opposite the part we have now reached. Hutton Moor was once a tract of low sandy heatherland but it is now cut through by the railway and almost entirely enclosed. The following are the rarer plants of the roadsides, fields and streamside in the vicinity of Hutton Conyers ;

<i>Myosurus minimus</i>	<i>Jasione montana</i>
<i>Spergularia rubra</i>	<i>Salvia verbenaca</i>
<i>Ornithopus perpusillus</i>	<i>Pyrola media</i>
<i>Vicia sylvatica</i>	<i>Iris foetidissima</i>
<i>Sambucus Ebulus</i>	<i>Carex pseudo-cyperus</i>
<i>Filago minima</i>	<i>Leptobryum pyriforme</i>
<i>Erigeron acris</i>	

At Myton the Swale and Yore join, the river now bearing the name of Ouse and keeping it till it opens out into the Humber estuary.

In plants of the Montane category this district is about upon a par with West Swale, the two being considerably below West Tees and considerably above any of the others. The Addleburgh *Bryum elongatum*, the Appersett *Ceterach*, the Woodhall *Scrophularia Ehrharti*, and the Whernside *Oligotrichum* are species which with us are peculiar to this district

and they are all four plants of West Yorkshire, and the same may be said of *Cotyledon Umbilicus*, which is not classed here with the Montane species. In plants of the Xerophilous category the district is about upon a par with West Swale and Derwent, these three being considerably above any of the others. The district contains only a very limited tract of the Central Valley and for plants of the Hygrophilous category is below all the others except West Tees and Esk; and for the Rarer ascending species it is below West Swale, East Tees, East Swale and Derwent.

**GEOGRAPHICAL ANALYSIS OF THE FLORA OF THE YORE DISTRICT.  
AREA 260 SQUARE MILES.**

CATEGORY.	Number of species.	Per centage of total native flora.
1 Montane species .. ..	55	9
2 Xerophilous „ .. ..	46	8
3 Maritime „ .. ..	2	—
4 Hygrophilous .. ..	35	6
5 General ascending species	351	57
6 Scattered ascending „	115	18
7 Local ascending „	11	2
8 Colonists .. ..	53	
9 Denizens .. ..	20	
Total number of the species.	689	

## CHAPTER VIII.

### NO. 6. THE NIDD AND WHARFE DISTRICT.

(THE AINSTY.)

This district is considerably smaller and contains within its limits much less variety of situation than any of the others. It is 84 square miles in area, being bounded on the north by the Nidd, on the east by the Ouse, on the south by the Wharfe, and on the west by a conventional line drawn from Colthorpe on the Nidd to the Wharfe side between Thorp Arch and Wetherby. The city of York is about midway between the two points where the Nidd and the Wharfe join the Ouse, about half of it being situated on the west side of this latter river. The Magnesian Limestone forms a sloping bank along the north side of the Wharfe as far westward from Thorp Arch as the district extends, and the remainder of it, fully 80 square miles, belongs to the Central Valley. There are no streams of any considerable size which run through the district, but the rivers which bound it on three sides are large and fine. As in the rest of the Central Valley, the ground varies very slightly in level and nowhere attains an elevation above the sea of 100 yards. The soil is sometimes clayey, but more often light and sandy, especially in the north-east. Besides York and Acomb the district contains several pleasant rural villages, which are separated from one another by well-cultivated fields, intersected by long winding grassy lanes, and in addition to these, two lines of main road and three of railway run through it and the towns of Thorp Arch and Tadcaster are situated just beyond its limits.

The best botanical localities are Askham bogs and the sloping wooded bank of Magnesian Limestone which margins the Wharfe above Thorp Arch. At Thorp Arch, as at Tanfield, the most noteworthy plants of the limestone are species which range under the *Xerophilous* category. The following is the Thorp Arch list ;

<i>Thalictrum flexuosum</i>	<i>Epilobium angustifolium</i>
<i>Aquilegia vulgaris</i>	<i>Pastinaca sativa</i>
<i>Actæa spicata</i>	<i>Caucalis daucoides</i>
<i>Cochlearia officinalis</i>	<i>Sambucus Ebulus</i>
<i>Helianthemum vulgare</i>	<i>Galium tricornæ</i>
<i>Viola hirta</i>	<i>Asperula Cynanchica</i>
<i>Stellaria nemorum</i>	<i>Scabiosa columbaria</i>
<i>Hypericum montanum</i>	<i>Helminthia echioides</i>
<i>Astragalus glycyphyllos</i>	<i>Picris hieracioides</i>
<i>Hypoglottis</i>	<i>Solidago Virgaurea</i>
<i>Spiræa Filipendula</i>	<i>Inula Conyza</i>
<i>Rosa Sabini</i>	<i>Spécularia hybrida</i>
<i>micrantha</i>	<i>Chlora perfoliata</i>
<i>Linaria Elatine</i>	<i>Narcissus pseudo-narcissus</i>
<i>Lathræa squamaria</i>	<i>Convallaria majalis</i>
<i>Calamintha Acinos</i>	<i>Melica nutans</i>
<i>Lithospermum officinale</i>	<i>Glyceria distans</i>
<i>Neottia Nidus-avis</i>	<i>Brachypodium pinnatum</i>
<i>Orchis pyramidalis</i>	<i>Hordeum sylvaticum</i>
<i>Ophrys apifera</i>	<i>Gymnostomum tenue</i>
<i>muscifera</i>	<i>Pottia Heimii</i>

*Viscum album* grows in the woods at Nun Appleton and *Euphorbia amygdaloides* has been found by Mr. O. A. Moore in a copse between Bilton and Wighill Park. Askham Bogs are one of the most interesting of those carrs of the Central Valley of which mention has been made. They are situated by the side of the York and North Midland railway not far from Copmanthorp station, and consist of several acres of ground which is quite undrained. They yield *Cladium Mariscus* and abundance of *Carex paradoxa*, and are bounded by brown peaty ditches, and in some places are overgrown by aboriginal trees and brushwood, Alder, *Rhamnus Frangula*, *Myrica Gale*, and *Osmunda regalis* in beautiful condition, in addition to which the following interesting plants occur ;

<i>Ranunculus trichophyllus</i>	<i>Lemna trisulca</i>
<i>Lingua</i>	<i>Juncus obtusiflorus</i>
<i>Rubus plicatus</i>	<i>Carex stricta</i>
<i>Myriophyllum alterniflorum</i>	<i>pseudo-cyperus</i>
<i>Parnassia palustris</i>	<i>Arundo Calamagrostis</i>
<i>Carduus pratensis</i>	<i>Lastrea Thelypteris</i>
<i>Rumex Hydrolapathum</i>	<i>Leskea polyantha</i>
<i>Hydrocharis Morsus-ranæ</i>	

*Carex paradoxa* grows also in a similar but smaller carr which is situated between the villages of Healaugh and Askham Richard. The following plants grow about the brickponds at Hob Moor, on the western outskirts of York :

<i>Cochlearia officinalis</i>	<i>Lemna trisulca</i>
<i>Veronica triphyllos</i>	<i>Carex axillaris</i>
<i>Hydrocharis Morsus-ranæ</i>	<i>pseudo-cyperus</i>
<i>Typha angustifolia</i>	<i>Tortula rigida</i>

The following are the rarer plants of the sandy tract which extends from Holdgate and Acomb southward and westward ;

<i>Myosurus minimus</i>	<i>Vicia lathyroides</i>
<i>Alyssum calycinum</i>	<i>Sedum Telephium</i>
<i>Arabis hirsuta</i>	<i>Lactuca virosa</i>
<i>Sagina ciliata</i>	<i>Filago minima</i>
<i>Geranium pyrenaicum</i>	<i>Veronica triphyllos</i>
<i>Trifolium scabrum</i>	<i>Marrubium vulgare</i>
<i>Ornithopus perpusillus</i>	<i>Allium oleraceum</i>

The following are the rarer plants of the foot of the city-walls, the meadows on the west side of the Ouse and other places in the immediate neighbourhood of York ;

<i>Barbarea stricta</i>	<i>Chenopodium murale</i>
<i>Saponaria officinalis</i>	<i>Atriplex deltoidea</i>
<i>Cerastium aquaticum</i>	<i>Polygonum mite</i>
<i>Trifolium fragiferum</i>	<i>minus</i>
<i>Epilobium roseum</i>	<i>Rumex aquaticus</i>
<i>Picris hieracioides</i>	<i>palustris</i>
<i>Salvia verbenaca</i>	<i>Potamogeton flabellatus</i>
<i>Chenopodium olidum</i>	<i>Glyceria rigida</i>
<i>urbicum</i>	

Several of the common ericetal plants and of the frequent sylvestral plants of the dales seem to have disappeared from this highly cultivated district. Of the Montane plants it has only seven of the commoner species and these are almost, if not quite, restricted to the calcareous undulations in the vicinity of the Wharfe. In Xerophilous and Hygrophilous plants it occupies an intermediate position amongst the districts, and although it is much smaller than any of the others, yet for the Rarer ascending species one district is below it.

GEOGRAPHICAL ANALYSIS OF THE FLORA OF THE AINSTY.  
AREA 84 SQUARE MILES.

CATEGORY.	Number of species.	Per centage of total native flora.
1 Montane species .. ..	7	1
2 Xerophilous „ .. ..	34	6
3 Maritime „ .. ..	—	—
4 Hygrophilous .. ..	43	8
5 General ascending .. ..	351	64
6 Scattered „ .. ..	104	19
7 Local „ .. ..	11	2
8 Colonists .. ..	61	
9 Denizens .. ..	15	
Total number of species.	627	

## CHAPTER IX.

### NO. 5. THE EAST TEES DISTRICT.

This includes the western portion of Cleveland. A large proportion of its watershed on the east and south reaches into the Middle zone, but, unlike the Esk district, it does not include any considerable tract of heatherland within its limits, and the greater part of its surface is under one hundred yards above the sea level. The main stream of Tees forms the boundary of the district on the north-west, and a branch of moderate size, which is called the Leven, runs through it from east to west.

The higher hills along the line of watershed are all capped by the Sandstone of the Lower Oolite, the maximum thickness of which, in this tract, is under three hundred feet. Below it, occupying the steep slope of the moorlands, and spreading out for a considerable breadth round their base, stretch the Liassic beds, with a maximum thickness of 850 feet; and west of the line where the Lias ceases there is fully one-half of the district which belongs to the great Central Valley.

The southern fork of the Leven rises on the edge of the Middle zone in front of Burton head (1489 feet), the loftiest of the East Yorkshire peaks. From the top of this hill there is a very fine and extensive view of the dales of the Esk and the Derwent and the moorlands which surround them, over the low-lying cultivated Cleveland country on the north, of Kildale Moor and the wooded basaltic ridge and the peak of Roseberry Topping rising behind it, and further to the west, of the Tees estuary, and the long winding line of the Durham coast as far as Hartlepool and Sunderland and the mouth of the Tyne. From this culminating peak a line of high moorland, with an abrupt westward slope, runs in a northern direction towards another branch of the same stream. From Burton head another line of high moorland runs also due west, the highest peaks being immediately over



the edge of Cleveland, and the Cleveland streams, the branches of the southern fork of the Leven, scarcely penetrating the moorland mass, whilst on the south of the peaks there is an extensive area of hill-country and the streams have to run down long dales before they reach the open valley. At the head of Bilsdale, which is the hollow immediately west of Burton head, the pass is under 300 yards, and the Oolitic Sandstone quite cut through. West of this we have the Wainstones (1317 feet), Cranimoor (1427 feet), and Carlton Bank (1338 feet), bare undulated peaks separated from one another by the glens which unite to form Bilsdale : and still further to the west the watershed ridge reaches 1048 feet over Whorlton and Swainby, from which point the boundary line of the hill-country sweeps abruptly round towards the south. Along the line of this hill-bank, which bounds Cleveland on the south, the Lias attains an elevation of 1200 feet and the slope from the top of the hills down to about 100 yards is very sudden. Along the crest of the hill the Oolitic Sandstone forms crags at several points, the bank being in some places bare and shaly and in some places overspread with fir plantations. In one place only is there a rounded knoll of hill insulated from the principal mass, and that is in the neighbourhood of Whorlton, towards the western extremity of the embankment. The southern branch of the Leven runs parallel with the bank at a short distance from its base, and although several small streams have their rise upon this hillside, only one of them has a dale, and that is called Scugdale, and is situated also near the western extremity of the ridge. The following are the rarer plants of the woods and rocks and hillslopes from Battersby westward by way of Burton head and Ingleby Greenhow to the neighbourhood of Stokesley ;

*Drosera anglica*  
*Rubus plicatus*  
     *mucronatus*  
*Ribes alpinum*  
*Hieracium gothicum*  
     *crocatum*  
*Juniperus communis*  
*Andræa Rothii*  
*Gymnostomum rupestre*  
*Brachyodus trichodes*  
*Blindia acuta*  
*Dicranum fuscescens*  
*Distichium capillaceum*  
*Grimmia trichophylla*  
*Orthotrichum pumilum*  
     *phyllanthum*  
*Zygodon Mougeotii*

*Zygodon conoideus*  
*Tetrodontium Brownianum*  
*Aulacomnion androgynum*  
*Bryum crudum*  
     *Zierii*  
*Mnium subglobosum*  
*Mielichhoferia nitida*  
*Bartramia calcarea*  
     *Halleriana*  
     *Cederi*  
*Discelium nudum*  
*Fissidens pusillus*  
*Schistostega osmundacea*  
*Hypnum stramineum*  
     *crassinervium*  
     *exannulatum*

The more northern branch of the Leven, of which mention has been already made, has its rise in the recesses of the hill-country, and runs for some distance down a dale the only dale of any considerable size which there is in this drainage district. By one of the forks of this branch which runs down a deep lonely gill a triangular tract of hill is separated from the main mass. The glen is called Lounsedale and the hill Kildale Moor, and it reaches an altitude of 1064 feet. The main dale of this northern branch of the Leven is called Kildale. The pass from its upper extremity into one of the branch dales of the Esk does not reach the height of the Oolite, which here descends considerably lower than at Burton head, and the North Yorkshire and Cleveland railway now margins its stream, and runs across the narrow heathery pass into Eskdale. The basaltic dike from Ayton passes through Kildale Moor, and ascends Kildale in the direction of Castleton, and in some places woods and fir plantations stretch up the slope of the hill to the edge of the heather. The following are the rarer plants of Kildale and Lounsedale ;

<i>Geranium sylvaticum</i>	<i>Arundo Calamagrostis</i>
<i>Rubus plicatus</i>	<i>Epigejos</i>
<i>mucronatus</i>	<i>Festuca pseudo-myurus</i>
<i>Sprengelii</i>	<i>Andræa Rothii</i>
<i>Guntheri</i>	<i>Sphagnum fimbriatum</i>
<i>Lejeunii</i>	<i>Dicranum rufescens</i>
<i>Epilobium angustifolium</i>	<i>Hedwigia ciliata</i>
<i>Ribes alpinum</i>	<i>Grimmia trichophylla</i>
<i>Hieracium gothicum</i>	<i>Diphyscium foliosum</i>
<i>Carex stricta</i>	<i>Tetraplodon mnioides</i>
<i>pendula</i>	<i>Hypnum stramineum</i>

Opposite the north-west corner of Kildale Moor is the singular hill called Roseberry Topping. It is a rounded knoll of hill, sharply insulated from the main mass of the moorland, standing boldly out against the level country, and forming a conspicuous object from the surrounding plain and the valley far away. It is capped with a crag of Oolitic Sandstone and attains an elevation of 1057 feet. In hedges at the little village of Newton, which lies immediately beneath it, and 700 feet below its summit, *Rosa hibernica* grows. From Kildale moor the basaltic dike passes on the south side of Roseberry Topping, and underlies a wooded ridge about 200 yards in height behind the village of Great Ayton, from which point it declines westward past Langbargh till it is lost beneath the New Red Sandstone of the Central Valley. Above Ayton it is called Cliff rigg,

above Langbargh, Langbargh rigg. In two or three places by the side of the stream near Ayton are bushes of *Salix acutifolia*. The following are the rarer plants of the woods and fields of the basaltic dike in this vicinity ;

*Viola hirta*  
*Medicago maculata*  
*Trifolium striatum*  
*Spiræa Filipendula*  
*Rubus mucronatus*  
*Rosa gracilis*  
*Poterium Sanguisorba*  
*Sedum anglicum*

*Scabiosa Columbaria*  
*Tragopogon porrifolius*  
*Campanula Rapunculus*  
*Lamium Galeobdolon*  
*Narcissus pseudo-narcissus*  
*Allium Scorodoprasum*  
*Hedwigia ciliata*

Not far from the western edge of the Lias there is an insulated mass of hill, called Eston Nab, which is capped with Oolitic Sandstone and attains an altitude of 800 feet. It immediately overlooks the Tees estuary, and the Ironstone beds of the Lias are worked largely upon its sea-ward slope. The two branches of the Leven the course of which we have been tracing unite near the town of Stokesley, and the stream flows with many windings in a north-western direction past Hutton Rudby and Hilton through the Central Valley portion of the district and falls into the Tees between Yarm and Stockton.

The course of the main stream of Tees we have still to follow. It is now a fine large river, and flows with many windings through a richly cultivated flat country. Along the edge of this drainage district its general course is towards the north-east, and its banks about Middleton and Dinsdale are often steep and pleasantly wooded. The town of Yarm is on the Yorkshire side of the river not far from the mouth of the Leven. From Yarm up the stream to Worsall is a pleasant sail by boat when the tide is high. Five miles north-east of Yarm is the town of Stockton-on-Tees, the principal part of which stands upon the Durham side of the stream. The following are the rarer plants of the woods and low marshland and sandy fields near the Tees in the neighbourhood of these two towns ;

*Nymphæa alba*  
*Trollius europæus*  
*Lepidium latifolium*  
*Saponaria officinalis*  
*Cerastium aquaticum*  
*Myriophyllum verticillatum*  
*Oenanthe crocata*  
*Lachenalii*

*Epilobium angustifolium*  
*Galium boreale*  
*Campanula glomerata*  
*Epipactis media*  
*Orchis pyramidalis*  
*Butomus umbellatus*  
*Sagittaria sagittifolia*

The thriving town of Middlesbro', with its docks and blast-furnaces, stands upon the Yorkshire shore just where the river begins to open out into an estuary. A list of the introduced plants of the ballast hills in the neighbourhood of this town will be given hereafter. From Middlesbro' to Redcar the coast is margined by a series of low marshy fields, intersected by tidal ditches,\* in front of which the shore line is bounded in some places by low undulated sandhills. The railway runs not far from the sea in a direct line between the two points, beneath Eston Nab and the woods of Wilton, and in front of the long straggling village of Coatham. The following are the rarer plants of the salt-water ditches, sandhills and salt marshes of this part of the coast, which is, as has been already remarked, the only portion of the North Yorkshire sea-line which furnishes a good supply of the characteristically Maritime species;

<i>Thalictrum minus</i>	<i>Atriplex Babingtonii</i>
<i>Ranunculus Baudotii</i>	<i>deltoidea</i>
<i>hirsutus</i>	<i>littoralis</i>
<i>Cakile maritima</i>	<i>Beta maritima</i>
<i>Crambe maritima</i>	<i>Salsola Kali</i>
<i>Lepidium latifolium</i>	<i>Schoberia maritima</i>
<i>Sinapis tenuifolia</i>	<i>Salicornia herbacea</i>
<i>muralis</i>	<i>radicans</i>
<i>Viola hirta</i>	<i>Triglochin maritimum</i>
<i>Silene maritima</i>	<i>Zostera marina</i>
<i>Sagina maritima</i>	<i>Ruppia maritima</i>
<i>Honckeneja peploides</i>	<i>Zannichellia pedicellata</i>
<i>Spergularia media</i>	<i>Juncus maritimus</i>
<i>Stellaria Borœana</i>	<i>cœnosus</i>
<i>Cerastium tetrandrum</i>	<i>Scirpus glaucus</i>
<i>Geranium sanguineum</i>	<i>maritimus</i>
<i>Trifolium fragiferum</i>	<i>Carex extensa</i>
<i>Astragalus Hypoglottis</i>	<i>distans</i>
<i>Eryngium maritimum</i>	<i>Phleum arenarium</i>
<i>Apium graveolens</i>	<i>Glyceria maritima</i>
<i>Sium latifolium</i>	<i>distans</i>
<i>Helminthia echioides</i>	<i>Borreri</i>
<i>Carduus tenuiflorus</i>	<i>procumbens</i>
<i>Carlina vulgaris</i>	<i>oliacea</i>
<i>Artemisia maritima</i>	<i>Triticum pungens</i>
<i>Convolvulus Soldanella</i>	<i>acutum</i>
<i>Salvia verbenaca</i>	<i>Elymus arenarius</i>
<i>Glaux maritima</i>	<i>Hordeum maritimum</i>
<i>Armeria maritima</i>	<i>Lepturus filiformis</i>
<i>Chenopodium urbicum</i>	<i>Pottia Heimii</i>
<i>Atriplex portulacoides</i>	<i>Trichostomum topheaceum</i>

\* For a broad open ditch, either of fresh or of salt water, *stell* is here the local name.

The sandhills of the coast line between Redcar and Marske, like those between Redcar and Middlesbro', yield some of the commoner Xerophilous species. Here occur *Cerastium arvense*, *Poterium Sanguisorba*, *Scabiosa Columbaria*, and *Astragalus Hypoglottis*.

This district has very nearly all the characteristically Maritime species which are to be met with anywhere in North Yorkshire, *Hippophae rhamnoides* and *Asplenium marinum* being the only exceptions. For plants of the Montane category it is third out of the four hilly districts of the east. Its Xerophilous plants are few in number and rare, being very nearly restricted to the coast sandhills and basaltic ridge. For Hygrophilous plants it has five of the districts above, and three below it, and for the Rarer ascending species only the much larger districts of Derwent and West Swale conspicuously exceed it.

GEOGRAPHICAL ANALYSIS OF THE FLORA OF THE EAST TEES DISTRICT.  
AREA 155 SQUARE MILES.

CATEGORY.	Number of species.	Per centage of total native flora.
1 Montane species .. ..	21	4
2 Xerophilous „ .. ..	19	3
3 Maritime „ .. ..	51	8
4 Hygrophilous .. ..	38	6
5 General ascending .. ..	351	56
6 Scattered „ .. ..	139	22
7 Local „ .. ..	11	2
8 Colonists .. ..	58	
9 Denizens .. ..	23	
Total number of species.	711	

## CHAPTER X.

### No. 4. THE ESK DISTRICT.

This district includes the eastern portion of Cleveland. A large proportion of its surface is made up of undulated heatherland, and broad ramified dales of the eugeogenous type of character. The Esk flows through the district from west to east, the principal dales which its branches run down being upon the south side of it. The line of watershed round the upper part of the river on the south extends into the Middle zone; but on the north of the river the broad sweep of heatherland, which occupies the greater part of the surface between the Esk and the coast line, nowhere from Castleton eastward reaches an altitude of 1000 feet, and is mostly considerably lower. It is a district of steep crumbling sea cliffs, and pleasant dales, and undulated swells of low heatherland, but including very few ridges or peaks which reach even the Middle zone, and very little low lying, flat country; and of our nine drainage districts this is the only one within which no portion of the Central Valley is comprised.

Throughout the district, except along the course of the basaltic dike, the Lower Oolite occupies the higher, and the Lias the lower levels of the surface. South of the Esk we have the Lias at an elevation of 1200 feet in Burton head, and from thence declining due east to a height of rather more than 500 feet in the cliff on the south side of Robin Hood's bay. The Esk runs in a synclinal depression of the strata, the Oolite coming quite down to the shore on the north side, and very nearly so in the cliffs on the south side of its mouth. But on the north side of the river the beds rise again, and we have the Lias at an elevation of nearly 1000 feet in Roseberry Topping and Guisbro' Moor, and from this point sinking to 180 feet in Huntcliffe, and 340 feet in the great cliff near Lofthouse.

Sleddale, the dale of the north-west branch of the Esk, begins not far from Roseberry Topping. At first its stream runs parallel with the Kildale branch of the Leven, and this dale is separated from Kildale only by a narrow ridge of hill. On the opposite, or north-eastern side of the dale, a ridge of moorland runs parallel with it for four miles, and attains an elevation of 1078 feet. The lower part of the dale is broad and open, and contains many farmhouses, surrounded by woods and cultivated fields. The following are the rarer plants of this dale and the surrounding moors;

<i>Hypericum elodes</i>	<i>Cinclidotus fontinaloides</i>
<i>Myriophyllum verticillatum</i>	<i>Mnium subglobosum</i>
<i>Scirpus pauciflorus</i>	<i>Anæctangium compactum</i>
<i>Carex teretiuscula</i>	<i>Hypnum nitens</i>
<i>Sphagnum molluscum</i>	stramineum
<i>Gymnostomum rupestre</i>	giganteum

Castleton, the centre of population for the upper part of Eskdale, is situated near the point where the Sleddale stream unites with one which flows from the south-west. In addition to Sleddale, three of the branch dales from the south, Baysdale, Westerdale, and Danbydale, all open out into the main dale of the Esk within a short distance of Castleton. The ridge of hill from Burton head eastward along the line of watershed between Esk and Derwent reaches for several miles continuously into the Middle zone, and Looschoe Moor, at the head of Danbydale, attains an elevation of fully 1400 feet. The ridges of hill between these dales are narrow, and stand out boldly into the main dale of Esk. Baysdale is a secluded, thinly populated dale, with an abbey and thick fir plantations; Westerdale, a branched and more cultivated and populous hollow; and Danbydale from Castleton runs up due south into the recesses of the high anticlinal ridge which forms the drainage summit. Neither about the Esk nor along the crest of the dales about Castleton, is there much rock to be seen, but everywhere pastoral farmhouses, and woods and green meadows emerging from beneath the swelling curvatures of the lines of the heathery hills. The following are the more remarkable plants of this neighbourhood;

<i>Geranium sylvaticum</i>	<i>Hedwigia ciliata</i>
<i>Anthemis nobilis</i>	<i>Grimmia trichophylla</i>
<i>Bidens tripartita</i>	<i>Orthotrichum rivulare</i>
<i>Vaccinium Oxycoccus</i>	Drummondii
<i>Myrica Gale</i>	<i>Mnium stellare</i>
<i>Juniperus communis</i>	subglobosum
<i>Andræa Rothii</i>	<i>Fontinalis squamosa</i>
<i>Dicranum fuscescens</i>	

From Castleton to the mouth of the Esk at Whitby the distance is fourteen miles, the course of the stream due east, and the fall in its bed but trifling. On the north-east of Castleton the moor attains an elevation of 988 feet in Danby Beacon, which commands an excellent view of a wide surface of heathery country on the north and north-east, diversified by tumuli and woods and glens, and bounded by the winding line of the coast. Lower down the river there is on the north a long narrow wooded glen called Stonegate gill, and on the south three more of the branch dales, Great Fryupdale, Little Fryupdale, and Glazedale. On the end of the spur of hill between Danbydale and Fryupdale stand the ruins of the old castle of the Bruces, from which Castleton takes its name, surrounded by plantations of feathery larches. There is a communication over a neck of land at their head between the two dales of Fryup, and on the end nearest the Esk of the ridge which separates them is Danby Crag, a sandstone edge with a dark holly wood upon its slope, and alder and birch below. There is above Lealholme bridge a pleasant steep wooded rocky glen, called Crunkley gill, which is hemmed in upon one side by the termination towards the Esk of the ridge between Fryupdale and Glazedale: and here grow *Rubus Guntheri*, *Fissidens pusillus*, *Hypnum pumilum* and *H. heteropterum*. Opposite where Glazedale opens out we have upon the edge of the heather at an elevation of about 200 yards, and at a distance from the Esk of a mile, the little town of Egton, and between Glazedale and Goathland dale is the most picturesque portion of the river. The channel of the stream is more or less rocky for a considerable distance. The basaltic dike, which from Castleton to this point runs along the the south side of the dale, here crosses the stream, and forms a scar of dark-coloured rock upon its northern bank. The Esk flows in serpentine fashion beneath steep much undulated spurs of rock-crested moorland, the summits of which rise to a height of 150 or 200 yards above it, and the slopes of which towards the river are covered with wood, partly natural and partly planted. On the north of the stream rises the basaltic crag of Limber hill: on the south for a mile the woods of Arncliffe border it: and beyond them, at the bottom of a nest of hills which surround it upon every side, except where the streams break through them, is the village of Egton bridge. This is a favourite place for excursionists from Whitby, and is easily reached by the railway, which runs from Whitby up the main dale of Esk as far as the bottom of Goathland dale, and there turns to the south to ascend the latter hollow; and there is a station at Grosmont, the site of an old priory, and now the centre of the mining industry of Eskdale, which is situated a mile to the east of Egton bridge.



Goathland dale is much the largest of the branch dales of this district. At first it is an open moorland glen, surrounded by hills which are considerably lower than the Loose hoe and Burton head peaks. Its western branch is called Wheeldale, and is a rocky sylvan glen, upon the stream of which there is a waterfall, called Nelly Ayre foss, over an edge of sandstone some forty feet in depth. The branch of the stream along which the railway runs is called Ellerbeck, and this also has several easily accessible waterfalls upon it, the best known of which, Thomasson's force, is very near the top of the railway incline, from which it is approached up a winding rocky glen. The following are the rarer plants of Goathland dale, and the neighbourhood of Egton bridge;

*Corydalis claviculata*  
*Euonymus europæus*  
*Inula Helenium*  
*Lathrea squamaria*  
*Myrica Gale*  
*Neottia Nidus-avis*  
*Narcissus pseudo-narcissus*  
*Schœnus nigricans*  
*Scirpus pauciflorus*  
*Carex lævigata*  
*pendula*  
*Osmunda regalis*

*Equisetum hyemale*  
*Sphagnum compactum*  
*Distichium capillaceum*  
*Didymodon cylindricus*  
*Orthotrichum rivulare*  
*Zygodon Mougeotii*  
*Mnium stellare*  
*Entosthodon Templetoni*  
*Fissidens osmundoides*  
*Hypnum heteropterum*  
*Silesiacum*

On the drainage ridge west of Goathland dale Lilhoe cross attains an elevation of 1000 feet, at a distance of five miles from the sea. From this peak an almost unbranched sylvan glen, called Iburndale, runs down to the Esk. Its stream is called Little beck, and it has a fine waterfall upon it, which is called Falling foss, and of which the hard arenaceous Dogger beds form the cap rock. These waterfalls of the branch dales of the Esk are all within the compass of a day's excursion from Whitby, and they are the only falls of any considerable size which we have on the east of the Central Valley. Below Sleights, and where Iburndale opens out, the main dale of Esk widens, and the stream curves gradually round towards the north. The heather is now left behind, and there are several villages of considerable size amongst the undulated ground which margins the stream upon both sides as we approach its mouth. At Ruswarp it receives on the south the stream of another dale, which penetrates the moors in the direction of the Derwent, and winding past pleasant woods, and heights diversified by halls and homesteads, it flows beneath the steep craggy banks

upon the slope and summit of which the town of Whitby is built into the ocean. The rarer plants of the lower part of the dale are

<i>Trollius europæus</i>	<i>Lastrea Fœnisecii</i>
<i>Hypericum Androsæmum</i>	<i>Tortula latifolia</i>
<i>Lathyrus sylvestris</i>	<i>Orchotrichum Sprucei</i>
<i>Campanula patula</i>	<i>Mnium serratum</i>
<i>Linaria repens</i>	<i>Hypnum heteropterum</i>
<i>Lamium Galeobdolon</i>	

We must now go back again to Roseberry Topping, and make the circuit of the coast. From Roseberry a line of high moor runs towards the sea in a north-eastern direction, with a steep slope towards the north-west. Amongst the undulations of the hill a pleasant stream takes its rise, which soon reaches the foot of the slope, and then flows down a wooded glen, in a channel diversified by rock in several places, to fall into the sea at Saltburn. The town of Guisbro' stands upon the banks of the stream at a distance of five miles from the sea, and at an elevation above it of not more than 100 yards. Immediately in front of the town the moor rises to a height of 700 feet above it, the steep slope covered with fir plantations and bilberry bushes, and crested by a fine crag of the freestone of the Lower Oolite, which is called Highcliff: and behind the town the swelling curves of Eston Nab rise to shut out the view of the Tees estuary. The rarer plants of the neighbourhood of Guisbro' are

<i>Sinapis tenuifolia</i>	<i>Epipactis ensifolia</i>
<i>Geranium sylvaticum</i>	<i>Sphagnum fimbriatum</i>
<i>Rubus Guntheri</i>	<i>Dicranum fuscescens</i>
<i>Hieracium tridentatum</i>	<i>Orthotrichum tenellum</i>
<i>Atriplex littoralis</i>	<i>Tetrodontium Brownianum</i>
<i>Juniperus communis</i>	

From Marske to Saltburn the coast is bounded by banks of sand and diluvial clay, which grow higher and higher towards the east, and inland are the hall and woods of Upleatham, upon the slope towards the east of a rounded hill of Lias, of which the summit is 550 feet above the sea. The view from Upleatham of the hollow of the stream which flows from Guisbro' to Saltburn, of the grey old castle of Skelton, and its environing woods upon the opposite slope, and of the village of Brotton and its church upon the summit of the bare ridge above, is very fine. From the Tees mouth as far eastward as the Saltburn stream, a beautiful sweep of hard sand, which is more or less covered at high water, stretches along the foot

of the sea-bank and sandhills: and west of this rising watering place the cliffs begin, to continue with breaks almost till the Esk is reached. The following are the rarer plants of the woods and sea-shore in this neighbourhood;

<i>Thalictrum minus</i>	<i>Artemisia maritima</i>
<i>Cakile maritima</i>	<i>Ligustrum vulgare</i>
<i>Helianthemum vulgare</i>	<i>Atropa Belladonna</i>
<i>Silene maritima</i>	<i>Salvia verbenaca</i>
<i>Euonymus europæus</i>	<i>Marrubium vulgare</i>
<i>Medicago maculata</i>	<i>Samolus Valerandi</i>
<i>Spiræa Filipendula</i>	<i>Carex pendula</i>
<i>Rosa Sabini</i>	<i>Arundo Epigejos</i>
<i>Scabiosa columbaria</i>	<i>Triticum junceum</i>
<i>Helminthia echioides</i>	<i>Fissidens crassipes</i>
<i>Carduus tenuiflorus</i>	

The streams of that portion of the coast which we have now reached have their rise amongst the broad surfaces of heatherland which ascend from the north bank of the Esk and of which Danby Beacon is the culminating peak. Beginning in heathery glens they soon sink through the Oolitic beds, and growing gradually larger as they descend, are often bordered with thick woods in the lower part of their course. Upon the sea margin, or within a short distance of the coast, there are in the breaks of the hill-country several villages of moderate size, partly agricultural and partly maritime, with a strong dash interfused of the iron and alum mining element: and between the gills which contain these streams and woods and villages, the spurs of the hill-country stretch out to form along the shore-line a series of magnificent precipices, the barriers which guard this prominent line of coast, bulwarks which as year follows year, and Summer succeeds to Spring, and Winter to Autumn, in unvaried cycle of repetition, the waves of ocean ceaselessly beat against.

The first crag, Huntcliffe, begins at Saltburn, and forms a prominent object in the view from Redcar and the Tees mouth. The greatest height which it reaches is 360 feet, and the lower part is composed of the Lower Lias Shale, and the upper part of the hard Ironstone and Marlstone beds, the whole being surmounted by a cap of glacial diluvium. The more notable plants of Huntcliffe are *Crambe maritima*, *Brassica oleracea*, *Carduus Marianus* and *Schistidium maritimum*. Then comes the Skinninggrave hollow and the pleasant sylvan stream and glen of Lofthouse, and beyond it the great cliff of Boulby, the loftiest of all the English coast crags. This stands boldly out against the sea and is altogether 660 feet in height,

the cap rock being the hard arenaceous beds of the lower Oolite, and the lower part shewing an excellent section of the Lias from its latest deposits down to a depth of 100 feet in the Lower Shale. Then comes the Staithes hollow, with its branched glen, beyond which the coast takes a more decidedly southern direction than heretofore. By the Staithes fault we have the strata depressed so that the Ironstone and Marlstone beds are brought down to the shore, and between Staithes and Sandsend the Oolite everywhere extends down to the sea cliffs, except at Runswick Bay, the highest crag of this part being south of Kettleness, 370 feet in height. Now that the railway runs to Saltburn on the one side, and to Whitby on the other, this grand sweep of craggy coast is brought within the range of easy access to tourists, and it is to be expected that it will be more visited, and become better known than it has been. The tide is often inconvenient for paying a visit to the crags from below, and to skirt their upper edge necessitates a good deal of rough scrambling, but to those who are able to make it, and who care for either magnificent scenery or geology, the walk between Saltburn and Whitby will richly repay the exertion.

At Sandsend the cliffs terminate and inland is the Mulgrave hollow, penetrating to the Lias, with its two streams and undulated shadowy woods, and antique and modern castles. The following are the rarer plants of these woods and the adjacent sea-shore ;

*Lepidium latifolium*  
*Honekenea peploides*  
*Cakile maritima*  
*Geranium sylvaticum*  
*Vicia sylvatica*  
*Rosa micrantha*  
*Lactuca virosa*  
*Inula Helenium*

*Pyrola media*  
*Salvia verbenaca*  
*Origanum vulgare*  
*Atriplex Babingtonii*  
*Neottia Nidus-avis*  
*Carex pendula*  
*Osmunda regalis*

From Sandsend to Whitby the coast is guarded by banks of diluvial clay, similar to those which occur between Marske and Saltburn. This is the tract of the lowest depression of the strata. The Lias is not anywhere to be seen and the Oolite forms the foundation of the sea bank, from the base of which extends a beach of sand, the greater part of which is overflowed at high water. The following are the rarer plants of the sea bank, and maritime plants of the shores of the Esk and other places in the neighbourhood of Whitby ;

<i>Glaucium luteum</i>	<i>Glaux maritima</i>
<i>Cakile maritima</i>	<i>Armeria maritima</i>
<i>Crambe maritima</i>	<i>Statice Limonium</i>
<i>Brassica oleracea</i>	<i>Atriplex Babingtonii</i>
<i>Sinapis tenuifolia</i>	<i>deltoidea</i>
<i>muralis</i>	<i>Salicornia herbacea</i>
<i>Honckeneja peploides</i>	<i>Hippohae rhamnoides</i>
<i>Spergularia media</i>	<i>Scirpus maritimus</i>
<i>Cerastium tetrandrum</i>	<i>Carex extensa</i>
<i>Medicago maculata</i>	<i>Glycercia maritima</i>
<i>Vicia sylvatica</i>	<i>distans</i>
<i>bithynica</i>	<i>procumbens</i>
<i>Parnassia palustris</i>	<i>Triticum junceum</i>
<i>Smyrnum Olusatrum</i>	<i>Lepturus filiformis</i>
<i>Apium graveolens</i>	<i>Pottia Heimii</i>
<i>Helminthia echioides</i>	<i>Tortula vinealis</i>
<i>Carduus tenuiflorus</i>	<i>Bryum uliginosum</i>
<i>Artemisia maritima</i>	<i>Hypnum polygamum</i>

From the Esk southward the beds rise in the direction of the anticlinal axis. Between Whitby and Baytown extends a continuous range of cliffs, the highest of which is under 300 feet in altitude. At first the Upper Lias Shale occupies the shore, and at Hawsker only a small depth of it is seen, and inland we have the calcareous bed of the Lower Oolite over a thick mass of its Lower Sandstones and Shales. From this point southward the rise in the beds is sudden. Before Baytown is reached both the two lower sets of Liassic beds make their appearance in the cliffs. They sweep round the slope of the undulated hollow at the bottom of which the little town is situated, overlaid along the shore line at the bottom of the hollow with banks of diluvium. The Peak cliffs, on the south side of the bay, are the termination against the coast of the line of high land which forms the ridge of watershed between Esk and Derwent. They are 600 feet in altitude, and exhibit lower beds of the Lias than are to be seen anywhere else in North Yorkshire.

Interesting as it is in respect of scenery and geology, this district is not rich botanically. Its hills are not high enough to produce a large number of the Montane species. It has only one thin bed of limestone amongst a thick mass of shales and sandstones, and its Xerophilous plants are few in number and rare. Its shore line is guarded mostly by steep and crumbling cliffs, upon which very few of the characteristically Maritime species grow. It does not contain within its limits any low-lying level country, and for the Rarer Ascending species is considerably under the average of the districts. It is richest in the ericetal and sylvestral flowering plants and mosses which affect low hilly tracts.

**GEOGRAPHICAL ANALYSIS OF THE FLORA OF THE ESK DISTRICT.  
AREA 235 SQUARE MILES.**

CATEGORY.	Number of species.	Per centage of total native flora.
1 Montane species .. ..	19	3
2 Xerophilous ,, .. ..	16	3
3 Maritime ,, .. ..	33	6
4 Hygrophilous .. ..	19	3
5 General ascending species	351	62
6 Scattered ascending ,,	127	22
7 Local ascending ,,	12	2
8 Colonists .. ..	48	
9 Denizens .. ..	22	
<b>Total number of the species.</b>	<b>637</b>	

## CHAPTER XI.

### NO. 3. THE DERWENT DISTRICT.

This district contains upwards of one fourth part of the whole of North Yorkshire, and is upwards of five hundred square miles in area, so that it is one half the size of an average English county. It has a sea-line which is sixteen miles in length from north to south, and from the coast to the watershed ridge on the west the distance is forty miles. Physically it consists of five tracts of country as follows;

1. *The Eugeogenous hills.* These are a range of undulated hills which extend southward from the watershed ridge which separates the tributary branches of Derwent from those of the Esk and Tees, and which, with the dales that intersect it, fills up the whole of the northern portion of the district. A line may be drawn for nearly forty miles from west to east along the ridge of these uncultivated moorlands, but from north to south the total breadth of this range is under ten miles. Like the Cleveland hills, they consist of Lower Oolitic strata based upon Lias. The dales are comparatively broad and open, and their streams run from north to south. As has been already stated, the culminating peak of the main ridge is the hill (Burton head) from which branches of the Esk, Leven and Derwent all flow. This is distant 25 miles from the point of coast which is due east of it, and in an eastern direction from Burton head the ridge declines, at first gradually, and afterwards more suddenly, in altitude, being 880 feet lower against the coast than in the summit-peak, which gives an average declination of 35 feet per mile. The ridges which divide the dales are in some cases almost as high as the main ridge, as will be explained when we come to speak of the dales in detail. This tract margins the coast from the anticlinal axis southward as far as Scarbro', which is fully three-fourths of the total sea-line of the district.

2. *The Dyageogenous hills.* These are a range of calcareous hills which are somewhat lower in altitude than those which have been already mentioned, and which extend from the coast at Scarbro' westward as far as the watershed of the district in that direction. They are due south of the hills of the eugeogenous range, and based upon their slope, with usually a steep escarpment towards the north, and a gradual slope in the direction of the low level country which borders them on the south. In breadth from north to south they vary from four to ten miles. The streams which take their rise amongst the northern range have to run through that of which we are now speaking before they reach the Derwent. These hills are usually much drier and more grassy than the others, the slopes of those parts of the dales which they enclose being steep, and often covered with dense woods. This range is also highest towards its western extremity, and grows gradually lower as we pass eastward. It margins with low cliffs the greater part of the coast from Scarbro' southward to Filey.

3. *The Vale of Pickering.* This is a tract of flat low-lying cultivated country on the south of the calcareous hills, which extends from the coast inland for thirty miles. A large proportion of it is not elevated so much as 100 feet above the sea-level, and the vale is much intersected by streams, and contains a considerable surface of carrs and low marsh-land. The Derwent runs through it from east to west, and forms the boundary of North Yorkshire on the south: and upon that side the Vale is bounded by the Chalk Wolds of the East Riding. With the exception of Scarbro', all the towns of the drainage district are either actually in this tract or very near the edge of it.

4. *The Howardian tract.* This comprises two narrow parallel terraces, which extend from the calcareous hills eastward to the Derwent, and which are situated on the south-west of the Vale of Pickering, and separate it from the great Central Vale of York. The northern terrace is composed of the calcareous rocks of the Lower Oolite, and its highest point is under 400 feet above the sea-level: the southern one of Lower Oolite based upon Lias; and its highest point is under 600 feet: and both of them decline gradually in elevation from north-west to south-east.

5. South of the Howardian tract the district contains a small portion of the great Central Vale.

We will take the coast-line first, and then the hill country and the dales, proceeding in order from east to west.

From the High Peak southward as far as Hayburn Wyke we have a grand range of cliffs, which between these two points, a distance of four



miles, sinks in altitude from 595 to 296 feet above high water mark. These precipices show a complete series of the beds of rock from the Lower Oolite down to the Lower Lias Shale. At Hayburn Wyke is the mouth of a secluded branched glen from the west and north-west, which is called Staintondale. Past Cloughton and Scalby the cliffs are lower, and the beds dip rapidly in a southern direction. At Cloughton Wyke the calcareous band of the Lower Oolite occupies the shore. At Scalby is the mouth of another little stream, which is connected with the Derwent by what is called the New Cut. Towards Scarbro' the Upper Sandstones of the Lower Oolite, with diluvium over them, form a cliff of under 200 feet in height. The Castle hill at Scarbro' is composed of an outlying mass of the hard calcareous rocks of the Middle Oolite, which form here a bold rocky promontory, which rises to a height of 300 feet, and stands out abruptly against the sea, and has the sea flowing round three-fourths of its circumference. The town of Scarbro' is situated upon the low diluvial sea-bank which this promontory guards, and inland from it extends the lowest ground which we have upon this line of coast, and a calcareous nab, called Oliver's Mount, rises abruptly from this low ground to a height of 510 feet, with a steep escarpment towards the north, and with what was once a sedgy mere at its base, but which is now greatly reduced by drainage. The following are the rarer plants of the shores, the slopes and cliffs of the Castle hill, and other places in this neighbourhood;

*Ranunculus Lingua*  
*Cakile maritima*  
*Sinapis tenuifolia*  
*Sagina ciliata*  
*Arenaria Lloydii*  
*Honckeneja peploides*  
*Spergularia media*  
*Medicago maculata*  
     *denticulata*  
*Trifolium scabrum*  
     *striatum*  
*Astragalus glycyphyllos*  
*Lathyrus sylvestris*  
*Epilobium angustifolium*  
*Sedum anglicum*  
*Smyrniolum Olusatrum*  
*Apium graveolens*  
*Sambucus Ebulus*  
*Helminthia echioides*  
*Picris hieracioides*

*Lactuca virosa*  
*Carduus Marianus*  
     *erriophorus*  
*Bidens cernua*  
*Inula Helenium*  
*Chlora perfoliata*  
*Atropa Belladonna*  
*Linaria spuria*  
     *Elatine*  
*Salvia verbenaca*  
*Calamintha officinalis*  
*Samolus Valerandi*  
*Atriplex arenaria*  
     *littoralis*  
*Salsola Kali*  
*Rumex maritimus*  
*Orchis pyramidalis*  
*Narcissus pseudo-narcissus*  
*Butomus umbellatus*  
*Triglochin maritimum*

Potamogeton	gramineus	Hymenophyllum	Tunbridgense
	rufescens	Pilularia	globulifera
	lucens	Equisetum	hyemale
Carex	stricta	Trichostomum	crispulum
Milium	effusum		mutabile
Glyceria	maritima	Tortula	rigida
	procumbens		papillosa
	loliacea	Schistidium	maritimum
	distans	Orthotrichum	phyllanthum
Asplenium	marinum	Bryum	uliginosum

Oliver's Mount is an outlying spur of the calcareous range. Between Scarbro' and Filey the highest point of the cliff is under 300 feet above high-water mark. From Scarbro' as far as Ewe Nab the Upper Sandstones of the Lower Oolite form the greater part of the cliff, and the calcareous band may be seen beneath them in several places. By a landslip in Cayton Bay we have the Oxford Clay brought down to the shore and over it there is a cliff of Calcareous Gritstone. North of the Redcliff fault we have all the beds of the Lower Oolite from the Lower Calcareous Gritstone down to the Kelloways Sandstone. South of the fault in Gristhorp cliffs we have a foundation of Lower Oolite, and above it a cliff of Middle Oolite, with the beds from the earliest deposit up to the same Lower Calcareous Gritstone. From this point the beds dip rapidly towards the south, the Calcareous Gritstone descending to the shore-level to form the conspicuous rocky promontory which bears the name of Filey Brig.

The main stream of Derwent is made up of numerous branches which rise amongst the heathery arenaceous moors a few miles inland from the coast, about midway between Whitby and Scarbro'. From the great Peak cliff, the head of its eastern branch is not distant more than two miles. The summit peaks which surround it range in height from about 800 feet on the east side to about 1000 feet on the west of the broad undulated heathery hollow down which the stream flows in a mainly southern direction. The principal dale bears the name of Harwood dale. Opposite Cloughton is the escarpment towards the north of the tabular calcareous range of hills, which attains a height of 633 feet in Suffield moor and 714 feet in Hackness moor. This mass of hill is penetrated by numerous digitated glens, with steep wooded embankments. Beneath the western edge of the escarpment of Hackness moor the stream flows beneath Barnescliffe down sylvan Langdale, its opposite bank guarded by a narrow calcareous ridge, which bears the name of Langdale Rigg. At the bottom of Langdale it receives a considerable affluent from the arenaceous moors on the north-

west, which runs for several miles at the foot of the calcareous escarpment, which from Hackness moor sweeps round towards the west; and here also it is joined by two smaller streams from the recesses of the same limestone hill, the glens of which are called Deepdale and Troutdale. With calcareous hills rising steeply above it upon both sides, it flows past the village of Hackness, and down the beautiful thickly-wooded glen called Forge valley, through the main mass of the calcareous range into the Vale of Pickering. The following are the rarer plants of the wooded glens and banks of limestone in the neighbourhood of Hackness;

<i>Helleborus viridis</i>	<i>Samolus Valerandi</i>
<i>Aquilegia vulgaris</i>	<i>Myrica Gale</i>
<i>Actæa spicata</i>	<i>Spiranthes autumnalis</i>
<i>Corydalis claviculata</i>	<i>Neottia Nidus-avis</i>
<i>Fumaria parviflora</i>	<i>Epipactis ensifolia</i>
<i>Viola lutea</i>	<i>Orchis pyramidalis</i>
<i>Sagina subulata</i>	<i>Ophrys apifera</i>
<i>Hypericum montanum</i>	<i>muscifera</i>
<i>Astragalus Hypoglottis</i>	<i>Narcissus pseudo-narcissus</i>
<i>Onobrychis sativa</i>	<i>Convallaria bifolia</i>
<i>Vicia sylvatica</i>	<i>maialis</i>
<i>Spiræa Filipendula</i>	<i>Carex pauciflora</i>
<i>Rubus saxatilis</i>	<i>teretiusecula</i>
<i>Cornus suecica</i>	<i>pendula</i>
<i>Picris hieracioides</i>	<i>lævigata</i>
<i>Hieracium cæsius</i>	<i>digitata</i>
<i>Carduus Marianus</i>	<i>Lastrea Fœnisecii</i>
<i>eriophorus</i>	<i>Osmunda regalis</i>
<i>Vaccinium Oxycoccus</i>	<i>Equisetum hyemale</i>
<i>Pyrola rotundifolia</i>	<i>Campylostelium saxicola</i>
<i>media</i>	<i>Trichostomum tophaceum</i>
<i>Atropa Belladonna</i>	<i>Orthotrichum Drummondii</i>
<i>Lathrea squamaria</i>	<i>phyllanthum</i>
<i>Calamintha Acinos</i>	<i>Tetrodontium Brownianum</i>

Through the Vale of Pickering the course of the Derwent is almost due west. At the point where it turns in a western direction, a small stream joins it from the east, which is called the Hertford river, and which rises not far from the coast near Filey, and flows for about five miles through low marshy ground down the hollow between the Chalk and the Limestone. West of Forge Valley are three small wooded glens in the limestone range, which are called Yedmandale, Beedale, and Sawdondale. The next dale to the main dale of Derwent which penetrates through the southern to the northern range of hills is called Newtondale. The head of this dale joins

the head of Goathland dale, and the Whitby and Pickering railway runs along the depression which is thus obtained, from Pickering up Newton-dale, over the watershed ridge, which at this point is under 200 yards in elevation, and then down Goathland dale in the direction of Whitby. Newtondale at its upper part is a steep, narrow, heathery gill, its sides crested in some places with edges of arenaceous crag. On the east of it Lilla Cross attains 1000 feet, and west of it several of the arenaceous peaks are between 800 and 900 feet in elevation. The calcareous range of hills is considerably broader between Hackness and Newtondale than it is a little further westward, and the highest part of its table-land is here 882 feet above the sea-level. A small branch glen which is deeply excavated in this plateau, and which is called the Hole of Horcum, is well known to botanists as a station for *Cornus suecica*, a Montane plant, which south of the Scotch Highlands, is known only in this tract, and amongst the Cheviots. The town of Pickering stands upon the banks of the Newtondale stream, just where it leaves the limestone. A copious spring, at a place called Keld heads, situated on the edge of the limestone west of Pickering, furnishes the source of the Costa, which flows southward through the valley and joins the Pickering stream and the Rye not far from where the latter falls into the Derwent. And east of Newtondale and the Hole of Horcum is a glen called Thornton dale, which, like the Hole of Horcum, does not penetrate beyond the limestone; and the stream of which flows into the Derwent before the Rye reaches it. Besides the *Cornus*, the following are the more interesting plants of Newtondale and the neighbourhood of Pickering;

*Trollius europæus*  
*Aquilegia vulgaris*  
*Corydalis claviculata*  
*Astragalus hypoglottis*  
*Rubus calvatus*  
*Hieracium cæsius*  
*Carduus eriophorus*  
     *heterophyllus*  
*Inula Helenium*  
*Salvia verbenaca*  
*Marrubium vulgare*  
*Myrica Gale*  
*Neottia Nidus-avis*

*Orchis pyramidalis*  
*Habenaria alba*  
*Ophrys muscifera*  
*Gagea lutea*  
*Convallaria majalis*  
*Potamogeton rufescens*  
*Gymnostomum curvirostrum*  
*Cynodontium Bruntio*  
*Dicranum fuscescens*  
*Tetradontium Brownianum*  
*Polytrichum gracile*  
*Bryum uliginosum*

The next three considerable dales of the arenaceous hills, Rosedale, Farndale, and Brantsdale, all penetrate the moorland mass to the high

anticlinal ridge which runs from Burton head eastward to the Peak cliff. The summits amongst which they take their rise, proceeding along the ridge from east to west, are as follows: Wheeldale hoe, 1043 feet; Shun-nor hoe, 1085 feet; Loose hoe, 1419 feet; Ralph Cross, 1409 feet; Westerdale moor, 1422 feet; and Burton head, 1489 feet; and digitations of hill which attain the Middle Zone stretch out for several miles southward between the dales. Of the three, Rosedale is the broadest and most populous, Brantsdale the least so. In Rosedale the ironstone of the Lower Oolite is now extensively quarried. It is conveyed to the Cleveland blast-furnaces by a line of railway which runs across the top of the moor from the mines to the head of the southern fork of the Leven. The streams of the three dales are called the Seven, the Dove, and the Bran. Each of them runs in a distinct dale through the calcareous range, which everywhere presents towards the north a steep escarpment, and is here not more than from two to four miles in breadth from north to south. The town of Kirby-moorside is situated upon the southern edge of the limestone not far from the Farndale stream. Kirkdale, celebrated for its cavern, is the lower part of the dale of the Bran where it breaks through the calcareous hills. Higher up this is called Sleightholme dale, and nowhere in the district have we a finer sweep of aboriginal wood than extends along the slopes of this stream, whilst from Sleightholme dale round the escarpment towards the north as far westward as Bilsdale stretches a continuous belt of larch plantations. From the Vale of Pickering the view up any of these wooded hollows of the wide extent of bleak moorland is very fine. Next comes Riccaldale, which does not penetrate far north of the calcareous range. The main stream of Rye rises amongst the northern moorlands, at a very short distance from the high escarpment which overlooks the Cleveland valley, and a western branch rises not far from the escarpment which overlooks the great Central Vale. Bilsdale is a fine deep dale with high peaks between the ramified glens which branch from it at its northern extremity, and has its sides crested in some places by edges of freestone. Snailsworth, the western glen, is a broad, much branched, undulated hollow, which is separated only by a high ridge from the low country which sweeps round the edge of this moorland tract. Between Snailsworth and Bilsdale there is a narrow heathery glen, which is called Ladhill gill: and at Hawnby the three streams unite together to form the main branch of the Rye. The following are the more interesting plants of these three last-mentioned dales;

*Barbarea intermedia*  
*Rubus plicatus*  
     *thyrsoides*  
     *mucronatus*  
     *Bloxami*  
     *hirtus*  
     *rosaceus*  
*Epilobium angustifolium*  
*Vaccinium Oxycoccus*  
*Juniperus communis*  
*Eriophorum latifolium*  
*Allosorus crispus*  
*Dicranum fuscescens*

*Didymodon flexifolius*  
*Hedwigia ciliata*  
*Grimmia trichophylla*  
*Ptychomitrium polyphyllum*  
*Orthotrichum rivale*  
*Tetradontium Brownianum*  
*Polytrichum fastigiatum*  
*Mnium stellare*  
*Fissidens pusillus*  
*Hypnum heteropterum*  
     *ochraceum*  
     *flagellare*  
*Fontinalis squamosa*

Opposite the bottom of Bilsdale on the east and due north of Helmsley, the calcareous range attains 1078 feet. From Helmsley in this direction runs up the pleasant sylvan glen which is described in detail at page 76. From the point where its three branches unite together, which is just ten miles distant from the head of Bilsdale, the Rye flows in a southern direction down a steep-banked, thickly wooded dale, through the calcareous range, past Rievaulx Abbey, and beneath Duncombe Park and Lord Feversham's woods and hall to Helmsley, where it enters the Vale of Pickering. The view from the terrace at Rievaulx of the ruins of the choir and refectory of the fine old Cistercian abbey, and the cottages which surround it, and the branching calcareous glens with thick woods upon their slopes, and bright green meadows by the side of the streams beneath, and of the heathery table-land of the Hambleton hills beyond, is well worth a climb to see; and, although the height of the stand-point is little above two hundred yards, yet the steepness of the hill-banks give the scene a well-marked montane aspect. The southern portion of the space between the three branch dales of Rye is occupied by two outlying elephant-shaped nabs of limestone, of which that on the east, which is called Easterside, attains a height of 1048 feet. On the slope of the other is placed the picturesque little village of Hawaby, a centre from which, in each direction, long lines of steep sylvan hill-banks radiate. From Hawaby the escarpment of the calcareous range sweeps round towards the north-west in the direction of Arden and Hambleton End. From north to south the Hambleton hills are about ten miles in length, the ridge of watershed, which from north to south sinks from nearly 1300 to 950 feet, being only a very short distance from their western edge, and the slope from it in the direction of the hills which overhang the Rye being very gradual. Several

glens branch from the Rye in a western direction to penetrate these hills, lonely little dales crested with rock at their upper parts, and lower down their embankments, like those of the main dale of Rye, covered with wood. The principal of these branch glens are called Ardendale, Yowlasdale, Nettleale, and Flazendale, and in a smaller one at Rainton heights, near Hawnby, there is a fine precipice of Calcareous Gritstone, about fifty feet in depth. Opposite Hood-hill the line which bounds the hill-country turns abruptly towards the east, and there is now a steep embankment crested with limestone which faces the south, and is continued past Ampleforth (849 feet), and Oswaldkirk (544 feet), sloping gradually in an eastern direction till it sinks into the Vale of Pickering. The following are the rarer plants of the woods and branching glens of the neighbourhood of Hawnby and Helmsley;

*Trollius europæus*  
*Helleborus viridis*  
*Aquilegia vulgaris*  
*Actæa spicata*  
*Draba brachycarpa*  
*Stellaria nemorum*  
*Tilia parvifolia*  
*Hypericum montanum*  
*Geranium sanguineum*  
*Euonymus europæus*  
*Spiræa Filipendula*  
*Rubus saxatilis*  
     *mucronatus*  
     *Guntheri*  
*Rosa Sabini*  
*Epilobium angustifolium*  
*Ribes alpinum*  
*Sambucus Ebulus*  
*Picris hieracioides*  
*Hieracium murorum*  
     *cæsius*  
     *tridentatum*  
*Carduus eriophorus*  
*Inula Helenium*  
*Jasione montana*  
*Atropa Belladonna*  
*Euphrasia rigidula*  
*Lathraea squamaria*  
*Salvia verbenaca*  
*Mentha sylvestris*  
*Calamintha officinalis*

*Lamium Galeobdolon*  
*Lithospermum officinale*  
*Primula farinosa*  
*Salix nigricans*  
*Spiranthes autumnalis*  
*Neottia nidus-avis*  
*Epipactis ensifolia*  
*Orchis pyramidalis*  
*Habenaria albida*  
*Ophrys apifera*  
     *muscifera*  
*Cypripedium Calceolus*  
*Iris foetidissima*  
*Convallaria majalis*  
*Schœnus nigricans*  
*Eriophorum latifolium*  
*Carex digitata*  
*Melica nutans*  
*Hordeum sylvaticum*  
*Dicranum fuscescens*  
*Orthotrichum Hutchinsiae*  
*Pogonatum alpinum*  
*Leptobryum pyriforme*  
*Bryum obeconicum*  
*Mnium stellare*  
*Bartramia calcarea*  
*Hypnum nitens*  
     *glareosum*  
     *vallisclausæ*  
     *depressum*  
*Cryphæa heteromalla*

From Helmsley through the Vale of Pickering the Rye flows in a south-eastern direction towards the Derwent. Seven miles from Helmsley it receives the united Brantsdale and Farndale streams; in three miles more that from Rosedale; and not far from its union with the Derwent the Costa joins it. From the point where the Rye joins it, the Derwent flows towards the southwest, till it becomes upon both sides a river of the East Riding. Upon the bank and in the neighbourhood of the river, from the junction downwards past Malton, several interesting Hygrophilous plants are to be met with, of which the following are the most noteworthy;

<i>Nymphæa alba</i>	<i>Butomus umbellatus</i>
<i>Ranunculus Lingua</i>	<i>Potamogeton flabellatus</i>
<i>Sium latifolium</i>	gramineus
<i>Cicuta virosa</i>	lucens
<i>Enanthe crocata</i>	<i>Lemna polyrrhiza</i>
<i>Hydrocharis Morsus-ranæ</i>	<i>Acorus Calamus</i>
<i>Sagittaria sagittifolia</i>	<i>Rumex Hydrolapathum</i>

The Howardian tract is separated on the north-west from the range of the calcareous hills over Ampleforth and Oswaldkirk by the hollow along which runs the Thirsk and Malton railway. The southern of its two terraces, that which is composed of sandstone, is during part of its course, the watershed between Foss and Derwent. Beginning at the north-western extremity, we have the park and hall of Newburgh upon its slope towards the railway, and the moors of Yearsley and Oulston upon the summit of the ridge, which, at this point, is nearly 600 feet in elevation. A few miles further east are the park of Wiganthorp, and the moor of Scakleton, below which rises a stream which flows on the south side of the ridge past the villages of Bulmer and Foston-le-clay to the Derwent. Mowthorpe dale is a small wooded glen where a branch of this stream penetrates the ridge. Then comes the village of Terrington and the woods and park and mansion of Castle Howard. The ridge at this point is not more than 300 feet in elevation, and it declines still more past Whitwell, Welburn, and Crambeck, in the direction of the Derwent.

The northern of the two terraces, that which is composed of calcareous materials, runs parallel with the other, but is not continued so far westward. On the south it has a steep escarpment, which in many places is covered with wood, but on the north its slope towards the Vale of Pickering is more gradual. At Gilling the sylvan nab which forms the termination of the ridge in a western direction, stands out boldly against the hollow along which the railway runs. At Hovingham and Slingsby two streams



from the arenaceous terrace break through the limestone, and upon the slope of the ridge towards the north the two villages are situated. Wath wood, Slingsby wood, Coneysthorp wood, and Hildenley wood, are all upon the escarpment of this ridge towards the south: and Terrington Carr, well known as a botanical locality, is a small heathery swamp, by the side of the Slingsby stream, in the trough between the two terraces. The town of Malton is situated upon the slope towards the Vale of Pickering of the calcareous ridge, upon the north bank of the Derwent. This Howardian tract furnishes a great variety of situation, and although it has none of the more decidedly Montane plants, yet we obtain here as many of the rarer species as are to be found anywhere in North Yorkshire within an equal area with the exception of Upper Teesdale, as the following list of its productions may testify;

*Myosurus minimus*  
*Trollius europæus*  
*Helleborus viridis*  
*Aquilegia vulgaris*  
*Actæa spicata*  
*Papaver hybridum*  
*Corydalis claviculata*  
*Fumaria Vaillantii*  
*Teesdalia nudicaulis*  
*Drosera anglica*  
     *intermedia*  
*Dianthus deltoides*  
*Silene anglica*  
*Arenaria tenuifolia*  
*Stellaria nemorum*  
*Radiola Millegrana*  
*Hypericum montanum*  
     *elodes*  
*Geranium sanguineum*  
*Euonymus europæus*  
*Rhamnus Frangula*  
*Trifolium striatum*  
*Astragalus glycyphyllos*  
     *Hypoglottis*  
*Ornithopus perpusillus*  
*Vicia sylvatica*  
*Spiræa Filipendula*  
*Rubus saxatilis*  
     *plicatus*  
     *mucronatus*  
     *Sprengelii*

*Rubus Bellardi*  
     *hirtus*  
*Rosa Sabini*  
*Epilobium angustifolium*  
*Caucalis daucoides*  
*Galium erectum*  
     *tricornne*  
*Pieris hieracioides*  
*Lactuca virosa*  
*Carduus Marianus*  
     *eriophorus*  
*Erigeron acris*  
*Inula Conyza*  
     *Helenium*  
*Campanula glomerata*  
     *Trachelium*  
*Specularia hybrida*  
*Jasione montana*  
*Vaccinium Oxycoccus*  
*Gentiana Pneumonanthe*  
*Atropa Belladonna*  
*Linaria Elatine*  
*Orobanche elatior*  
*Lathraea squamaria*  
*Salvia verbenaca*  
*Mentha Pulegium*  
*Thymus Chamædrys*  
*Calamintha Acinos*  
     *officinalis*  
*Lithospermum officinale*  
*Plantago Coronopus*

<i>Spiranthes autumnalis</i>	<i>Brachyodus trichodes</i>
<i>Neottia Nidus-avis</i>	<i>Dicranum Schreberi</i>
<i>Epipactis ensifolia</i>	<i>rufescens</i>
<i>Orchis pyramidalis</i>	<i>spurium</i>
<i>Ophrys apifera</i>	<i>Ceratodon cylindricus</i>
<i>muscifera</i>	<i>Trichostomum tophaceum</i>
<i>Gagea lutea</i>	<i>tortile</i>
<i>Convallaria majalis</i>	<i>Tortula ambigua</i>
<i>Potamogeton rufescens</i>	<i>rigida</i>
<i>Rhynchospora alba</i>	<i>aloides</i>
<i>Scirpus multicaulis</i>	<i>marginata</i>
<i>acicularis</i>	<i>papillosa</i>
<i>Carex divulsa</i>	<i>Bryum uliginosum</i>
<i>teretiusecula</i>	<i>turbinatum</i>
<i>limosa</i>	<i>obconicum</i>
<i>pseudo-cyperus</i>	<i>Mnium stellare</i>
<i>Arundo Calamagrostis</i>	<i>orthorhyncum</i>
<i>Epigejos</i>	<i>Paludella squarrosa</i>
<i>Melica nutans</i>	<i>Bartramia calcarea</i>
<i>Festuca pseudo-myurus</i>	<i>ithyphylla</i>
<i>Bromus erectus</i>	<i>Sphlachum ampullaceum</i>
<i>Brachypodium pinnatum</i>	<i>Fissidens pusillus</i>
<i>Hordeum sylvaticum</i>	<i>crassipes</i>
<i>Lastrea Thelypteris</i>	<i>Cylindrothecium Montagnei</i>
<i>Lycopodium inundatum</i>	<i>Hypnum nitens</i>
<i>Equisetum hyemale</i>	<i>crassinervium</i>
<i>Sphagnum laricinum</i>	<i>pumilum</i>
<i>Phascum Floerkeanum</i>	<i>tenellum</i>
<i>bryoides</i>	<i>elodes</i>
<i>patens</i>	<i>stramineum</i>
<i>alternifolium</i>	<i>Blandovii</i>
<i>Gymnostomum tenue</i>	<i>Crista-castriensis</i>
<i>microstomum</i>	<i>depressum</i>
<i>Seligeria pusilla</i>	<i>Neckera pumila</i>
<i>Anodus Donianus</i>	<i>Cryphaea heteromalla</i>

West of the Bulmer stream there is an outlying wooded hill capped with Lower Oolite, at Stittenham, but it is under 300 feet in height. A narrow tract of Lias occupies the slope in the direction of the Central Valley of the southern Howardian terrace. In the Central Valley the Derwent flows due south till it leaves the Riding. Buttercrambe moor is a low wooded heath, of the same kind as several which come within the district drained by the Foss. Here grow *Carduus pratensis*, *Cladium Mariscus*, *Polypodium Phegopteris* and *Lastrea Thelypteris*. At Stamford Bridge the river enters the East Riding.

This is considerably the largest drainage district of the nine, and has

considerably the largest flora. In Montane plants it is above all the other districts of the eastern subprovince, but below each of the three hilly districts of the west. For Xerophilous plants it is on a par with the Yore and West Swale districts, and amongst the thick woods and grassy banks of its calcareous hills many of the more interesting plants of this category grow plentifully. In Maritime plants it is not rich, especially when the length of its coast-line is considered. The Vale of Pickering furnishes a large number of Hygrophilous species, and for Rarer Ascending plants this district stands highest of the nine.

**GEOGRAPHICAL ANALYSIS OF THE FLORA OF THE DERWENT DISTRICT.  
AREA 515 SQUARE MILES.**

CATEGORY.	Number of species.	Per centage of total native flora.
1 Montane species .. ..	38	5
2 Xerophilous „ .. ..	46	6
3 Maritime „ .. ..	20	3
4 Hygrophilous „ .. ..	65	9
5 General ascending .. ..	351	48
6 Scattered „ .. ..	177	24
7 Local „ .. ..	33	5
8 Colonists .. ..	70	
9 Denizens .. ..	22	
<b>Total number of species.</b>	<b>823</b>	

## CHAPTER XII.

### NO. 2. THE EAST SWALE DISTRICT.

This district, like that of East Tees, consists of an edge of the eastern moorlands, a tract of undulated country underlaid by liassic strata which sweeps round their base, and beyond the Lias about one half of its total area is comprised in the great Central Valley: but in this case the line of the embankment of the moorlands runs north and south, and this district, unlike that of East Tees, has no coast line. Here also, as in East Tees, the watershed is only a very short distance from the edge of the hill, and no dales of any considerable size which belong to the district penetrate to the moorland mass, and the slope from a height of 900 or 1000 feet down to 300 feet is very sudden.

The western boundary of the district is formed by the Wiske till it joins the Swale, and afterwards by the latter river. The less elevated part of the district is often called the Vale of Mowbray. The Mowbray family were its ancient feudal lords, and the district as here defined is almost identical with the tract to which Mr. Grainge's book, which bears the title of "The Vale of Mowbray," refers. The principal stream which runs through it is called Codbeck. The hills which form its watershed on the east are the two ranges which run through the Derwent district from west to east, and terminate against the sea coast, as has just been explained.

First we will take the hill embankment, and afterwards the low country. The Codbeck and the Wiske both rise in the same glen, which is situated at the north-west corner of the great mass of the hills. This glen is called Searth Nick, and is a bare, bleak, treeless hollow, with the Wiske issuing from it at the north end, and Codbeck in an opposite direction. On the west of this glen is a steep narrow ridge, on the slope of which, towards the low country, are the woods of Arncliffe, and the ruins of the priory of

Mount Grace. The moors above Osmotherley are lower both than the arenaceous hills further west, and the calcareous range on the south. They are much undulated by the heathery glens in which run the branches of Codbeck and the Rye, the summit of the watershed ridge being here 1048 feet above the sea-level. Above Silton a spur of the arenaceous range stands out into the low country, and behind it is Black Hambleton (1289 feet), which is at once the highest point, and the termination in a western direction of the escarpment towards the north of the calcareous range. Opposite Kepwick and behind a round outlying mass of hill, called Kepwick Nab, is a bleak undulated hollow, shut in by moors upon three sides, in which a branch of Codbeck takes its rise. Above Kirby Knowle and Boltby another spur of arenaceous hill spreads out westward and south-westward from the main range. Above Kirby Knowle this moor is 880 feet in height, and has a craggy crest, and a little tarn in a hollow, formed by a landslip, upon its slope. In front of Boltby the moor is somewhat higher, and has a steep embankment, covered with fir plantations: and the escarpment, still capped with Lower Oolite, but much lower than Boltby Moor in elevation, is continued still further in a south-western direction, as far as Feliskirk and Mount Saint John, from which point it declines gradually into the low country. The main body of this rounded spur of hill is called Black Moor, from which on the north-west Wool Moor or Knayton Moor is separated only by a narrow glen. In the hollow between Black Moor and the main range another branch of Codbeck takes its rise, the two branch glens of which open out at the village of Boltby. The western of these is the most interesting, a deep, boggy, heathery, and wooded hollow, which is called Gurtog gill; to which, in times past, the members of our Thirsk Natural History Society have often resorted for Mosses, and Oak and Beech Fern.

Above Kepwick and Black Moor the calcareous table-land reaches a height of from 1100 to 1200 feet. From Boltby to where opposite Hood hill it turns abruptly due east, the continuity of the hill-bank is unbroken. The distance in a direct line is about four miles, but it is much more if the windings of the edge of the embankment are followed. This portion of the great calcareous range is called the Hambleton hills. In elevation it declines gradually from north to south from 1100 to 950 feet, but the embankment is so steep that these hills, as viewed from Thirsk, look much higher than they are in reality. The Calcareous Gritstone which crests the embankment forms fine precipices at three places, one above Boltby, the second opposite Thirsk, and the third at the southern extremity of the

escarpment. These are called Boltby Scarr, Whitstoncliff, and Rolston Scarr. Whitstoncliff especially is a noble crag. It measures fully one hundred feet in sheer perpendicular depth, and beneath it, as at Boltby and Rolston, the embankment slopes steeply for five hundred feet, and is thickly strewn with fallen fragments of the summit cliff. At the foot of this slope we have the only considerable tarn of these East Yorkshire hills. It is called Gormire, and is about three-quarters of a mile in circumference, with on the east the embankment of the main mass of hill rising steeply from its shore, and on the other three sides a high ridge of arenaceous hill sweeping round it. There are no streams except the mere runnels of the hill-bank which flow into it, and none flow from it: so that its waters are mainly supplied by rain, and diminished by evaporation. From the summit of Whitstoncliff the view upon a clear day is very fine and extensive.\* Immediately beneath is the precipice and the lake, and the steep embankment, covered with thickets of Brake and Blackthorn, and thickly strewn with fallen piles, confusedly upheaped, of massive and angular rocks. From Boltby Moor southward to Hood hill, a pleasant undulated wooded tract extends, and beyond the broad central valley is spread out like a map from the Tees southward as far as York, with Thirsk and Ripon marked conspicuously, and the lines of railway easily traceable by the smoke of passing and repassing trains. And beyond stretch the western moors, the huge bulk of Penhill looming in front to shut in Wensleydale like a barrier, and the higher Great Whernside peak, on the south of it, for a focus from which the undulated lines of hill stretch north and south till they are lost to view in misty distance. The following are the rarer plants of Gormire, and of the hill embankment from Searth Nick southward to Rolston Scar;

\* This is the locality of the following sonnet of Wordsworth's;

"Dark and more dark the shades of evening fell;  
The wished-for point was reach'd, but late the hour,  
And little could be gained from all that dower  
Of prospect, whereof many thousands tell;  
Yet did the glowing West in all its power  
Salute us:—there stood Indian citadel,  
Temple of Greece, and Minster with its tower  
Substantially expressed, a place for bell  
Or clock to toll from.—Many a tempting isle,  
With groves that never were imagined lay  
'Midst seas how steadfast! object for the eye  
Of silent rapture: but we felt the while  
We should forget them: they are of the sky,  
And from our earthly memory fade away."

<i>Trollius europæus</i>	<i>Dicranum fuscescens</i>
<i>Draba inflata</i>	<i>Tortula aloides</i>
<i>Viola lutea</i>	marginata
<i>Stellaria nemorum</i>	<i>Hedwigia ciliata</i>
<i>Geranium sanguineum</i>	<i>Grimmia trichophylla</i>
<i>Rubus calvatus</i>	<i>Tetrodontium Brownianum</i>
mucronatus	<i>Orthotrichum stramineum</i>
Bloxami	Hutchinsiae
Guntheri	<i>Bryum cernuum</i>
humifusus	torquescens
<i>Epilobium ligulatum</i>	obconicum
<i>Hieracium murorum</i>	<i>Mnium affine</i>
cæsius	cuspidatum
<i>Lathraea squamaria</i>	<i>Tetraplodon mnioides</i>
<i>Primula farinosa</i>	<i>Bartramia calcarea</i>
<i>Trientalis europæa</i>	<i>Fissidens pusillus</i>
<i>Lysimachia thyrsiflora</i>	<i>Hypnum crassinervium</i>
<i>Gagea lutea</i>	pumilum
<i>Potamogeton lucens</i>	tenellum
heterophyllus	heteropterum
<i>Acorus Calamus</i>	giganteum
<i>Festuca bromoides</i>	brevirostre
<i>Lycopodium selaginoides</i>	flagellare
<i>Pilularia globulifera</i>	pratense
<i>Brachyodus trichodes</i>	depressum
<i>Anodus Donianus</i>	

Opposite the south western corner of the calcareous range is an outlying nab, capped with limestone, which is called Hood hill, and which is nearly as high as the adjacent part of the main mass of moorland. Upon three sides it has an abrupt wood-covered slope, and in a southern direction declines more gradually. The escarpment of the calcareous range towards the south, from Rolston Scarr westward over Kilburn and Coxwold, is almost as abrupt as the slope which faces west. This portion of the calcareous plateau is between 800 and 900 feet, and the bank is mostly covered with woods. A small branch of the Swale takes its rise upon this embankment, but its glens do not penetrate far into the recesses of the hill-country. Cockerdale is a pleasant wooded rocky hollow, and two other branches of the same stream rise, one of them in Wass woods, and the other upon the southern slope of Hood hill. The ruins of Byland Abbey stand in the low ground at the foot of Wass Bank, and the extremity of the arenaceous Howardian terrace forms here the watershed of this district upon the south-east. The hall and fishpond of Newburgh are pleasantly situated in the midst of an extensive park upon the slope of the terrace in this direction, and still further west upon the same slope is the village of Hushwaite,

and above it the arenaceous crag of Beacon bank. The following are the rarer plants of the neighbourhood of Coxwold ;

Ranunculus circinatus	Arundo Calamagrostis
Lingua	Brachypodium pinnatum
Arabis hirsuta	Brachyodus trichodes
Stellaria nemorum	Anodus Donianus
Radiola Millegrana	Tortula marginata
Hypericum montanum	Mnium cuspidatum
Rubus Guntheri	Bartramia calcarea
Scrophularia vernalis	Fissidens pusillus
Lathrea squamaria	Hypnum crassinervium
Mentha sylvestris	pumilum
Calamintha officinalis	flagellare
Salix nigricans	depressum

We must now bid farewell to the hill-bank and turn to the low-country. Of all the streams of North Yorkshire the Wiske is the most sluggish, and has the least deeply-excavated stream channel. It usually is more like a broad ditch than a typical North Yorkshire rivulet. From Searth Nick its course is at first north-west, and afterwards due west through the low country for ten miles, and then it turns abruptly to the south, and runs for fifteen miles in that direction before it joins the Swale. Upon the banks of a small branch of the Wiske, not far from the eastern edge of the Central Valley, stands the town of Northallerton, the central town of the North Riding, and the place where its sessions are held, and its gaol is situated. This town is about six miles distant from the nearest point of the hills, and in its neighbourhood, within the bounds of this drainage district the following plants occur ;

Ranunculus Lingua	Myriophyllum verticillatum
parviflorus	Smyrniolum Olusatrum
Helleborus foetidus	Cuscuta Epilinum
Fumaria pallidiflora	Linaria minor
Alyssum calycinum	Veronica polita grandiflora
Nasturtium sylvestre	Buxbaumii
Viola hirta	Orobanche minor
Saponaria officinalis	Polygonum minus
Cerastium aquaticum	Sagittaria sagittifolia
Radiola Millegrana	Butomus umbellatus
Vicia sylvatica	Hydrocharis morsus-ranæ
Rubus plicatus	

A small piece of boggy ground which is situated not far from the junction of the Wiske with the Swale, and is called Newsham Carr, still remains in an aboriginal condition, and yields the following plants ;



*Ranunculus Lingua*  
*Cicuta virosa*  
*Rumex Hydrolapathum*

*Lemna polyrhiza*  
*Carex teretiuscula*  
*stricta.*

The course of Codbeck, from the Osmotherley end of Searth Nick until it joins the Swale, is south-westward through, or not far from, the undulated liassic tract which margins the hill-country, the total length of the stream being about twenty-five miles. Opposite Northallerton it is margined on the east by the woods of Cotcliffe, which extend for about two miles along the slope of a bank of the liassic shale, the summit of which is about 400 feet in height above the stream, and at the south end of this bank the sandstone of the Lower Oolite just shews itself. A considerable slip of land has recently taken place here, a part of the wood having glided down so gradually that the trees and brushwood which compose it are not destroyed: and over the site of what a few years ago was a grassy meadow by the side of the stream, there is now a steep, broken, wood-covered, clayey bank. We have here an instance, upon a small scale, of the same kind of landslide that has occurred at Kirby Knowle upon a much larger scale within the memory of man, and upon a much larger scale still at Gormire, at a period which is perhaps as far back as the great glacial inundation. At Brawith, Codbeck is increased by the stream which rises near Kepwick, and soon afterwards it is joined by a rivulet from Kirby Knowle and Mount Saint John. The town of Thirsk is situated upon the banks of Codbeck, upon the eastern edge of the Central Valley and at a distance of five miles due west of Whitstoncliff. Upon the east of the town the liassic slope attains 200 feet within a mile of it, and this altitude of surface is almost or quite maintained till the foot of the hill-bank is reached. The Boltby stream flows in a south-western direction past Sutton-under-Whitstoncliff and Bagby, and falls into Codbeck at Gristhwaite, and soon afterwards the latter pours its waters into the Swale. The following are the more interesting plants of the low country in the neighbourhood of Thirsk;

*Myosurus minimus*  
*Ranunculus floribundus*  
     *fluitans*  
     *hirsutus*  
*Fumaria pallidiflora*  
*Alyssum calycinum*  
*Turritis glabra*  
*Nasturtium sylvestre*  
*Sinapis tenuifolia*

*Viola peregrina*  
*Saponaria officinalis*  
*Silene anglica*  
*Cerastium aquaticum*  
*Stellaria brachypetala*  
*Radiola Millegrana*  
*Geranium pyrenaicum*  
*Rubus plicatus*  
     *thyrsoides*

Rubus Sprengelii mucronatus altheifolius	Polygonum laxum mite
Rosa Sabini rubiginosa tomentella	Rumex aquaticus
Epilobium roseum	Salix rubra
Ribes alpinum	Orchis ustulata
Sedum Telephium	Allium oleraceum
Torilis infesta	Scorodoprasum
Galium insubricum tricorne	Colchicum autumnale
Fedia Auricula	Typha angustifolia
Lactuca virosa	Juncus diffusus
Hieracium tridentatum	obtusiflorus
Erigeron acris	Apera Spica-venti
Specularia hybrida	Arundo Epigejos
Jasione montana	Equisetum hyemale
Gentiana Pneumonanthe	Gymnostomum tenue
Chlora perfoliata	Tortula aloides
Cuscuta europea	latifolia
Trifolii	papillosa
Atropa Belladonna	Ptychomitrium polyphyllum
Orobanche minor	Orthotrichum tenellum
Mentha viridis	rivulare
Calamintha Acinos	Sprucei
officinalis	Leptobryum pyriforme
Marrubium vulgare	Bryum oboenicum
Lithospermum officinale	Mnium affine
Primula farinosa	Fissidens crassipes
Lysimachia thyrsoflora	Hypnum speciosum
Chenopodium glaucum	Teesdalii
Atriplex deltoidea	polygamum
	Knieffii
	pratense
	Cryphæa heteromalla

The Coxwold stream runs in a south-western direction past Hushwaite and Birdforth, and falls into the Swale a short distance below the mouth of Codbeck.

In this district the Middle Oolite forms the surface of the Hambleton plateau from Black Hambleton southward to the escarpment over Coxwold and Wass, and is also the cap rock of Hood hill. At Whitstoncliff the series is 200 feet in thickness, the Coralline Oolite forming the summit of the table-land, the Lower Calcareous Gritstone the great cliff, and the Kelloways Sandstone the ferruginous crags, which are exposed at from 50 to 100 feet below it, at the summit of the steep sandy slope. The Lower Oolite forms the surface of Osmotherley moors, and sinks beneath the calca-

reous range, to reappear on the south of it. At Whitstoncliff the summit of this series is 850 feet above the sea-level, and its thickness 600 feet. In the Coxwold hollow it occupies the low ground and the summit of the ridge on the south, and a spur stretches out westward in the direction of Carlton Husthwaite and Thirkleby. The calcareous band is worked for lime in several places. The Upper Lias Shale was formerly worked for Alum and Jet at Thimbleby, and has recently been worked for Jet in Coteliffe wood.

For Montane plants this district is the second of the four hilly districts of the east. It has only a mere edge of limestone hill, and in Xerophilous species is not rich, neither are those which do occur plentiful. The low grounds from Thirsk and Northallerton westward to the Wiske and Swale produce a considerable number of Hygrophilous species, especially the vicinity of the first-mentioned stream: and for Rarer Ascending species this district is only below the more extensive districts of West Swale and Derwent.

**GEOGRAPHICAL ANALYSIS OF THE FLORA OF THE EAST SWALE DISTRICT.  
AREA 170 SQUARE MILES.**

CATEGORY.	Number of species.	Per centage of total native flora.
1 Montane species .. ..	23	4
2 Xerophilous „ .. ..	23	4
3 Maritime „ .. ..	0	0
4 Hygrophilous .. ..	54	8
5 General ascending species	351	56
6 Scattered ascending „	167	26
7 Local ascending „	13	2
8 Colonists .. ..	69	
9 Denizens .. ..	23	
Total number of the species.	715	

## CHAPTER XIII.

### NO. 1. THE OUSE AND FOSS DISTRICT.

This district and the Ainsty are the only two of our nine drainage districts which do not include within their limits any hills of the Middle zone, and this district, next to the Ainsty, is the smallest of the nine. The greater part of it was included in the royal forest of Galtres, which was kept for the purpose of a royal hunting ground almost in an aboriginal state from the time of the Saxons down to the year 1670, when an act of parliament was obtained, and the forest broken up and enclosed. Only a small portion of the watershed of the district on the north-east is above one hundred yards in elevation, and fully one half of its surface is within one hundred feet of the sea-level.

The Ouse, which is now a river of large size, forms the boundary of the district on the south-west, and the Foss and a smaller stream called the Kyle run through it from the north-east in that direction. Both these two latter take their rise upon the slope of the arenaceous Howardian terrace at its highest end, which is the point of watershed between Foss, Swale, and Derwent. The wooded slope of the terrace at Yearsley, and the steep wooded glen at the bottom of which are the Foss reservoirs, and the uncultivated heaths of the upper part of the ridge above them have something of a montane aspect: and from an elevation of nearly 200 yards on Yearsley moor there is a fine view down the glen to the Wolds in the distance, and towards the south-west of the ridge upon which Crayke Castle stands, and the wide sweep of low country, in the direction of York, beyond it. The following are the more interesting plants which grow here;

*Ranunculus floribundus*  
*Teesdalia nudicaulis*  
*Cerastium semidecandrum*  
*Spergularia rubra*  
*Sedum Telephium*

*Filago minima*  
*Plantago Coronopus*  
*Potamogeton heterophyllus*  
*Carex fulva*  
*Didymodon flexifolius*

A broad surface of undulated clayey country, underlaid by Lias, sweeps round the south-west of the terrace. Through this tract both the streams flow during the early part of their course, and out of it rises the hill of Crayke Castle (400 feet), which, like the terrace, is capped with Oolitic Sandstone. In the midst of the liassic tract, about midway between the two streams, the town of Easingwold is situated, and it includes several villages of considerable size. The south-western half of the district belongs to the Central Valley, and is populated but thinly. The soil is principally sandy, and there are several carrs, and plantations of fir-trees and tracts of uncultivated, boggy heatherland. Of these last, Pilmoor, by the side of the railway, upon the edge of the district which is nearest the Swale, and the commons or "forests" of Stockton and Strensall are the principal. The following are the rarer plants which grow upon these two last-mentioned heaths, along with several mosses and other plants which are rare in the Central Valley;

*Drosera intermedia*  
*Spergularia rubra*  
*Cerastium semidecandrum*  
*Radiola Millegrana*  
*Hypericum elodes*  
*Trifolium striatum*  
*Ornithopus perpusillus*  
*Epilobium angustifolium*  
*Peplis Portula*  
*Carduus pratensis*  
*Filago minima*  
*Jasione montana*  
*Andromeda polifolia*  
*Gentiana Pneumonanthe*  
*Cuscuta Epithymum*  
*Euphrasia rigidula*  
*Mentha Pulegium*  
*Lemna polyrhiza*

*Scirpus acicularis*  
*Arundo Calamagrostis*  
*Lycopodium Selago*  
                     *selaginoides*  
                     *inundatum*  
*Pilularia globulifera*  
*Equisetum hyemale*  
*Archidium phascoides*  
*Dicranum spurium*  
*Ceratodon cylindricus*  
*Campylopus brevipilus*  
*Bryum annotinum*  
                     *sanguineum*  
*Bartramia arcuata*  
*Physcomitrium fasciculare*  
*Hypnum elodes*  
                     *scorpioides*  
                     *lycopodioides*

In its course through the central valley portion of the district the Foss is a slowly-flowing stream with low banks, much resembling the Wiske in character, although considerably larger in size. The Wiske, the Foss, and the Derwent in its course through the Vale of Pickering, are the only typical valley streams which we have in North Yorkshire, and it is about these that the Hygrophilous plants principally cluster. The following are the rarer plants of what are called the Foss islands, a small piece of boggy ground which is intersected by ditches, near the junction of the stream

with the Ouse, and of the banks of the stream and its channel in the neighbourhood of York ;

<i>Nymphæa alba</i>	<i>Sagittaria sagittifolia</i>
<i>Nasturtium sylvestre</i>	<i>Butomus umbellatus</i>
<i>Cerastium aquaticum</i>	<i>Potamogeton compressus</i>
<i>Myriophyllum verticillatum</i>	<i>lucens</i>
<i>Ceratophyllum demersum</i>	<i>Lemna gibba</i>
<i>Chenopodium urbicum</i>	<i>polyrhiza</i>
<i>Polygonum minus</i>	<i>Sparganium minimum</i>
<i>mite</i>	<i>Phascom patens</i>
<i>Rumex palustris</i>	

A large portion of the city of York is included in the angle between the Foss and the Ouse. The following are the rarer plants of the suburb of Clifton, and the fertile sandy alluvial meadows which margin the Ouse on the north-west of the city ;

<i>Fumaria Boræi</i>	<i>Orchis ustulata</i>
<i>Barbarea stricta</i>	<i>Colchicum autumnale</i>
<i>sylvestris</i>	<i>Potamogeton flabellatus</i>
<i>Nasturtium sylvestre</i>	<i>Carex pseudo-cyperus</i>
<i>Saponaria officinalis</i>	<i>Alopecurus bulbosus</i>
<i>Cerastium aquaticum</i>	<i>Anacalypta Starkeana</i>
<i>Epilobium roseum</i>	<i>Tortula latifolia</i>
<i>Chenopodium olidum</i>	<i>Orthotrichum pallens</i>
<i>urbicum</i>	<i>Sprucei</i>
<i>murale</i>	<i>pumilum</i>
<i>Atriplex deltoidea</i>	<i>Leskea pulvinata</i>
<i>Rumex aquaticus</i>	<i>Hypnum cæspitosum</i>
<i>Orchis pyramidalis</i>	

This district has the smallest flora of the nine. The Montane and Xerophilous category are in it but nominally represented, and the Maritime category not at all. In the low grounds the Hygrophilous category is well represented. The clayey soils of the Lias, and the sandy soils of the Central Valley, do not furnish a great variety of situation, and the number of its Rarer Ascending species is below the average of the districts.

GEOGRAPHICAL ANALYSIS OF THE FLORA OF THE OUSE AND FOSS DISTRICT.  
AREA 133 SQUARE MILES.

CATEGORY.	Number of species.	Per centage of total native flora.
1 Montane species .. ..	9	2
2 Xerophilous ,, .. ..	10	2
3 Maritime ,, .. ..	0	0
4 Hygrophilous .. ..	52	10
5 General ascending .. ..	351	64
6 Scattered ,, .. ..	112	20
7 Local ,, .. ..	12	2
8 Colonists .. ..	52	
9 Denizens .. ..	16	
Total number of species.	614	

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TABULAR SUMMARY OF NUMBER OF PLANTS OF THE CONTRASTING GEOGRAPHICAL  
CATEGORIES IN THE NINE DRAINAGE DISTRICTS.

The reader is requested to study the following table, which brings into comparison the number of species of the contrasting geographical categories which the different districts furnish, in connection with the paragraph at page 92.

DISTRICTS.	CATEGORIES.				
	Montane.	Xerophilous.	Maritime.	Hygrophilous	Rarer Ascending.
9 West Tees ..	77	33	1	15	107
8 West Swale ..	52	44	1	62	178
7 Yore .. ..	55	46	2	35	126
6 Ainsty .. ..	7	34	0	43	115
5 East Tees ..	21	19	51	38	160
4 Esk .. ..	19	16	33	19	139
3 Derwent ..	38	46	20	65	210
2 East Swale ..	23	23	0	54	180
1 Ouse and Foss	9	10	0	52	124



PART THIRD.

## PART THIRD.

### BOTANY.



### CHAPTER XIV.

#### INTRODUCTION.

Our knowledge in detail of the character and mode of operation of the agencies which have been employed to bring about the distribution of plants and animals over the surface of the earth, and thus to produce the condition of things which at the present time we behold, is very limited indeed. Which are true species, which aboriginally distinct, and which mere modifications of one common stock produced by the influence of mere change of circumstance, this point it is impossible for us to determine with certainty with regard to what appear to us now as truly distinct species, and are described as such in our handbooks. We cannot sail backward along the stream of time, and unravel the intricacies of their bygone genealogies. We are obliged, for practical purposes, to take them as we find them; to describe or receive as species all those associations of an indefinite number of plants and animals which we observe to possess in common what we agree to consider sufficiently well-marked permanent characteristics; the difference between the so-called analysts and synthesists of descriptive zoology and botany really amounting to no more than this, that whilst both are agreed in the theoretic idea that the individuals of a species should possess permanent characteristics in common, yet when it comes to the carrying out of the idea into practice, the latter insist upon more decidedly

marked diagnostic characters, that is to say, upon broader lines of demarcation than the former. And hence arises the fact, that species as described in books are often combinations of very unequal value, and that, especially in what are called critical genera, such as *Rosa*, *Rubus*, *Hieracium*, *Salix*, and *Viola*, a series of forms which one author will include under a single species only, another author will subdivide and separate amongst a considerable number.

And as it is with our knowledge of the genealogy of species, so it is with our knowledge of the character and mode of operation of the agencies which have been employed to bring about their diffusion. Except in those cases where the spreading abroad of species has manifestly been effected by human agency, operating either in a direct or in an indirect manner, we are almost entirely in the dark as to how they have reached the places where we now see them. We cannot tell which are true aboriginal species. We cannot tell whether each true aboriginal species was in its original creation represented by a single individual, or a pair of individuals, or by an indefinite number of individuals, or pairs; neither, even if we choose to assume the latter to be the case, are we in a position to say to what extent the facts which relate to species dispersion have been brought about at a period coincident with or posterior to the date of their original creation.

But although our ignorance is so great, and our chance of diminishing it so small, when in treating of the distribution of species we consider the active agencies by which their diffusion has been brought about, yet when we come to speak of the agencies which have operated to restrict their distribution the case is different. Each species, we can say with confidence, is plainly limited in its distribution by certain physical conditions; and if we seek out in detail what the physical conditions which accompany the distribution of a species are, we are placed in a position in which we can form something of an estimate as to which of those conditions have upon the distribution an essential bearing.

*The influence of human agency in modifying a flora.* In viewing the flora of any definite district, as we have it at the present time, it is needful, if we would wish to inquire respecting its geographical relations, that we should in the first place observe carefully, and having observed, should bear in mind constantly, to what extent, and in what way human agency has been brought to bear upon it. In any long-settled, long-cultivated tract of country, the modification which has been brought about by human agency is, of necessity, very considerable. Around the spot where man fixes his dwelling, swamps, moors and woods disappear, to make way for

cultivated fields, roads and gardens; aboriginal species characteristically paludal, uliginal, ericetal, and sylvestral, become more or less restricted in their range, or are exterminated altogether; and the places which they occupied are filled up by the species which man cultivates, and the weeds which these bring in their train. Thus not only is the natural range of the plants indigenous to the country very much interfered with, but interspersed amongst them, and side by side with them, we see growing wild a host of importations, more or less firmly settled down, the line between which and the genuine natives it is often very difficult to draw in detail with a firm hand.

In treating of the characteristics of our three climatic zones, indications have already been given of the heights up to which, in the country upon which we are engaged, the various manifestations and results of human agency interfere with and modify the natural condition of its surface. The Upper Zone remains almost in its aboriginal state. The Middle Zone has been comparatively little interfered with, and although a considerable part of it is enclosed, yet houses, cultivated fields, gardens and planted woods occupy only a very small proportion of the surface which it includes, and only a very small proportion of the introduced plants extend their range into its limits. But although in the Lower Zone a considerable extent of the surface still remains as heatherland, and a little as aboriginal woodland, yet in the remainder of this zone, and especially throughout the vales and low country, the case is very different: for not only do the fields where the Cereal Grasses, forage, potatoes and clover are cultivated, and the roadsides, hedgerows, and waste ground in the neighbourhood of towns, villages, farm-houses, gardens and parks furnish a large number of these imported plants, but also the woods, the hedgerows and the pastures are often plainly, and still oftener presumably, of artificial origin, even when yielding trees, shrubs, grasses and other plants, which elsewhere in the district evidently occupy their natural places of growth.

Excluding those which are probably or certainly extinct, and probably or certainly mis-reported, our list contains the names of upwards of 1150 species of Flowering Plants and Ferns, all of which have some sort of claim to be enumerated in a catalogue of the wild plants of North Yorkshire. Of these, 872 species appear to possess a more or less clear title to be regarded as aboriginal and genuine inhabitants of the Riding, and so far as we can judge from present appearances, it is these and these only that we must regard as composing its proper and natural flora. Out of the plants which grow wild with us at the present day, we must, if we wish to restrict our

list to those to which Nature gives us a title, strike out one species in four as introduced. But a large number of these introductions are now very thoroughly settled down. It is easy to arrange nearly all of them under two categories, the species of which, in respect of the plenty and the places in which they grow, differ notably. These two categories are, first, importations by means of Agriculture; and, second, importations by means of Horticulture; and the only introduced species which do not range conveniently under either of these heads are about a score of ballast plants and two or three trees. Following the nomenclature of the Cybele, I have called the more frequent and more thoroughly established agricultural weeds by the name of Colonists, drawing the line between them and the Natives so as to exclude from the Native list those species which scarcely occur except in cultivated fields and about rubbish heaps, but so as to include as Natives a number of species such as *Viola tricolor*, *Senecio vulgaris*, *Pyrethrum inodorum*, and the Nettles, which though most frequent in cultivated ground, are also to be met with in quarries and along the sea-shore, about roadsides and on waste ground, and which, by a little more stringent interpretation of the probabilities which point towards introduction, would be added to the Colonist list. All except four of our Colonists are plants of but annual duration. Many of them are of very frequent occurrence, and it is probable that a large proportion of them are plants which have had their original home in those lands where the Cereal Grasses were first cultivated, and that their seeds have been carried about with cornseed from country to country. The Denizens, with the exception of one or two trees, and possible introductions along with ballast, are the well-established certain or probable introductions of Horticulture, and are mostly either ornamental plants, the common trees or shrubs with eatable fruit which are grown in gardens, or plants of real or supposed medical utility. *Populus alba*, *Sinapis muralis*, *Daphne Mezereum*, *Prunus avium* and *Chelidonium majus* are typical representatives of these five classes of character. It is to the Denizens, as the term is here employed, that M. Alphonse De Candolle\* would restrict the use of the term "naturalized," denying it to the Colonists, but with us in Britain the word has been used with great looseness of application. The Aliens are plants which either make or have made their appearance in cultivated fields, casual stragglers from garden cultivation, imported trees not sufficiently estab-

\* In M. De Candolle's elaborate handbook, entitled "Geographie Botanique Raisonnee," as well as in Watson's "Cybele Britannica," most of the matters are discussed in detail which in this chapter are just touched upon. These are the books which any of my readers who may wish to follow up the subject ought to procure.

lished to take a place amongst the Denizens, or else species which have been introduced with ballast either from other parts of Britain, or from the European Continent. Of the Agricultural Aliens, *Melilotus vulgaris* and *Bromus arvensis* are examples: of the Horticultural Aliens, *Eranthis hyemalis* and *Cheiranthus Cheiri*: of the trees, *Carpinus Betulus* and *Castanea vesca*: of the ballast plants, *Mercurialis annua* and *Galactites tomentosa*. So that, in respect of citizenship, we have five categories to separate the species amongst, viz. :—

1. The Natives, so far as we can now judge, the aboriginal possessors of the soil.

2 and 3. The Colonists and Denizens, the well-established importations of the Historic period.

4. The Aliens, importations not fully established.

5. The Incognita, species to be rejected from the list, either as being extinct, or as requiring confirmation before they can be claimed with safety.

*The Stational range of species.* In treating of the distribution of species we have in the first place to consider the familiar facts as to what is called *station* or *habitat*. Amongst plants we all know that one affects woods and shaded places, another dry banks and wall tops, a third pastures and grassy commons, a fourth bogs and ditches, a fifth heaths, a sixth marshes by the sea-side and the vicinity of salt springs inland, a seventh cultivated fields and waste ground: some species being restricted, with but trifling exception, to one of these kinds of locality, others growing as if indifferently in two or three of the kinds, whilst others are to be met with habitually in several or almost all of them. Each species plainly has its own special power of adaptation to varied physical conditions, and that power is very different in different natural orders, different genera, and even often in different species of the same genus. It is the power of adaptation possessed by the plant which the geographical botanist has to deal with when he comes to consider it, just as the physiologist has to deal with its structure and the functions of its various organs, and the describer of species and systematist has to deal with its diagnostic characters. So much light or shade, such a kind of soil, so much heat, so much moisture, such a degree of consistency of soil; in regard to all these points each species has its own special constitution, and this must be provided for in every one of its stations in order to enable it to stand its ground in them and prosper. To designate the different kinds of locality we may employ a series of adjectives such as *sylvestral*, *pratal*, *pascual*, *ericetal*, *uliginal*, *agrestal*, and say that *Drosera rotundifolia* is a *uliginal*, *Capsella bursa-pastoris* an *agres-*

tal, and *Hieracium tridentatum* a sylvestral plant. These terms answer the purpose of conveying, in connection with a species, the idea of a certain definite association of physical conditions: but we must bear in mind when we employ them and read them that they do not, and from the nature of the case cannot, cover and give expression to much in regard to conditions of station which has an important bearing upon distribution, and that, for the most part, they deal only with such of what may be called the factors of station as are to be met with in most districts of an ordinary character. What I mean by this is, that in most tracts of country of any considerable extent there are to be found woods, hedges, meadows, pastures, bogs, heaths, and cultivated fields, the woods producing characteristically sylvestral species, the hedgerows characteristically septal species, the meadows and pastures characteristically pratal and pascual plants, and so on through the series. In a limited tract of country the most prominent facts of species-distribution, so far as we can trace any connection with physical agencies at all, are plainly to be associated with differences between the condition of different parts of its surface such as are expressed by these adjectives. But when we come to speak of the physical conditions and agencies which interfere to modify or regulate the distribution of species over a more extensive area, these adjectives answer our purpose no longer, and we are compelled to leave them behind.

*The influence of temperature upon the distribution of species.* And then comes the question what are the factors that we can deal with which the terms we have alluded to do not cover which have a bearing upon the distribution of species on a grand scale. Of these, Temperature is plainly the most important, and the difference in the way in which in different cases its influence is exercised opens out a wide field for research and consideration. A plant is not a mere machine, like a thermometer, but a living organism, and in considering the question we must take care to remember that such is the case. Conditions of life and biological phenomena we have need to bear constantly in mind, and here as elsewhere, the mysterious principle of vitality constantly interferes to limit the application of our generalisations. Especially have we to remember the differences in respect of duration which plants present. An Annual plant normally grows up to perfection, and produces flower and seed during the same year in which the seed that produces it was sown. A Biennial plant produces only stems and leaves the first year, flowers and fruit the second, and like the Annual, after one flowering and fruiting dies away. A Perennial plant lasts for an indefinite number of years, yielding flowers and fruit

from the same root an indefinite number of times. So that in any locality the plants of these different categories in respect of duration are exposed in a very different manner to the range of variation which its temperature presents. Trees and shrubs, especially evergreens, are exposed more or less to the temperature of all the seasons of the year: herbaceous perennials and biennials, as a general rule, less so to the colds of Winter, especially in those countries where, as in ours, the cold almost suspends vegetation for a period, and where the ground is often overspread for a length of time with a covering of snow: whilst annuals mostly grow up to perfection and perish during, in our climate, a few months of the warmer part of the year.

Different species attain perfection at different seasons of the year, some earlier and some later, some in Spring, some in Summer, others in Autumn, some having a wide range of flowering and fruiting time, others opening out their flowers in any locality, at a particular time, year after year, with great regularity. No phanerogamous plant can develop itself below the freezing point, and in different plants the sap begins to circulate at very different degrees of the thermometer. The seeds of *Capsella bursa-pastoris* begin to germinate at 33 or 34 degrees of Fahrenheit's thermometer, but the seeds of Wheat require a temperature of 38, and the seeds of Flax of 40 degrees before they will begin to swell. Willows and Poplars will sprout at a low temperature, whilst Vines, *Liriodendrons*, and *Magnolias* need a much higher one before their buds will begin to unfold. Each plant has, as it were, its own especial zero, all degrees of temperature below which exercise, at any rate, no favourable influence upon its growth. So that not only does the development of species take place at different times and seasons, but we see also that the temperatures of even the same season of development, for each species require to be specially divided between three separate divisions, those which are too low to do it any good, those which are more or less useful to it, and those which are too high to do it any good. And from this it results that a comparison between two different localities, not only of the mean temperature of the year, but even of the mean temperature of any particular month or season, will often furnish results which will hold good only with much exception so far as the plants which they produce, and as some species more than others, are concerned.

So numerous and complicated are the influences which interfere to prevent the attainment of precision, that it seems to me by far the safest course not to attempt to speak of particular sums of temperature which species need in order to develop themselves, and that if we try to do so it



is more likely to mislead and to confuse than to help us. If we wish to express in the form of a generalisation the bearing in our climate of temperature upon species distribution, we must apparently say, that species are usually limited by cold, operating either *positively*, that is by the extreme colds or sudden falls of temperature in winter or the latter part of the autumn, or by the frosts of spring killing their young shoots and flower buds, this principally applying to trees and shrubs, and especially to evergreens; or by cold operating *negatively*, if we may so speak, that is to say, by the want of a certain amount of heat spread over a certain period of time, the heat being intense enough, and the period of time during which it is continued long enough, to enable them to produce their flowers and ripen their seeds, in the case of perennial species, if not every year, at least occasionally. This negative restriction must be the main one, and will apply to annuals, biennials and perennials alike, although the different periods of the year at which different species develop themselves must make a considerable difference in its application. Limitation by excess of heat often shews itself as limitation by the lessening of humidity, but with us, in restricting the distribution of plants, it evidently operates only in a comparatively unimportant manner.

The sums of summer heat and the extreme minima of the colder parts of the year are then the data of temperature with which botanical geography is specially concerned. The following propositions embody the principal details with regard to the distribution of our local temperatures which it seems needful to recall to mind in this connection. We must remember that in observations upon temperature it is the monthly means of the air in the shade that are stated, and no doubt these upon the whole are the data which are most valuable to have. But they are deduced from the average of a number of years, and sometimes the temperature of a month rises above and sometimes falls below the average. They take equal cognizance of all degrees of temperature alike, both those which affect plants and those which do not. The temperature which a plant receives is partly that of the air, and partly that of the ground, which is somewhat different to, and much more uniform than that of the air. There is a wide difference, especially at the warmest part of the year, between the temperature in the shade and in places which are exposed to the sun, as the tables which are given at page 46 shew in detail: and what has been stated respecting the temperature of springs may also suitably be referred to in connection with plants. These propositions embody those details with regard to the distribution of local temperature which seem to have any prominent bearing

upon the question we are now considering. In giving them it is hardly necessary to say that they are a mere essay, of course as true and thorough as I can make it at this present time, but still, that with regard to various points which come within their range, our information and observations are very limited and incomplete.

1. In the shade, as compared with the temperature of the air at four feet from the ground, mean temperature is lower upwards, and several degrees lower upon the grass. The daily maxima in the sun are higher than the daily maxima in the shade, on an average of from 5 to 6 degrees in Winter to from 20 to 30 degrees in Summer.

2. At a depth of one foot in the ground the mean temperature is on the average fully one degree above the mean temperature of the air in the shade, the ground being proportionately or absolutely lower than the air in Spring and Summer, higher in Autumn and Winter: and the difference between the extreme months of the year being less in the ground than in the air by 5 degrees.

3. As we ascend from the low country amongst the hills, the mean temperature of the air sinks at an average rate of about one degree Fahrenheit per hundred yards, the lowering being apparently more in maxima than in minima, above the average in Spring and Summer, below it in Autumn and Winter, and the ground temperatures, especially the minima, falling less rapidly than the aerial means.

4. The distribution of absolute winter minima follows a totally different plan from that of the sums of summer heat: whereas these latter fall gradually as we ascend the hills, winter minima, on the contrary, are often conspicuously less extreme at an elevation than in the open low country, and instead of the temperature growing gradually lower as we ascend, within certain not very narrow limits it rises.

5. As compared with the inland low country, at the sea-side the annual means are slightly higher, and the absolute winter minima conspicuously higher: but the sums of summer temperature are appreciably lower in proportion to the annual means.

The following table gives the number of species of the Flowering Plants and Ferns which have been noted at the various elevations from the low country upwards.

ALTITUDINAL RANGE OF THE FLOWERING PLANTS AND FERNS OF NORTH YORKSHIRE.		
Height in Yards.	Number of Species.	Per centage of total flora.
Coast level and below 100 yards	854	86
At 50—100 yards, .. ..	848	85
150 .. ..	714	72
200 .. ..	639	64
250 .. ..	569	57
300 .. ..	498	50
350 .. ..	407	41
400 .. ..	372	37
450 .. ..	298	30
500 .. ..	267	27
550 .. ..	212	21
600 .. ..	170	17
650 .. ..	126	13
700 .. ..	111	11
750 .. ..	90	9
800 .. ..	68	7
850 .. ..	24	2½

It has been explained in the chapter on Climate that 66 of these species are essentially characteristic of a climate more boreal than that of our low country: but that the Montane species reached at any altitude as we ascend never compensate in number for the Ascending species which cease. In considering this table of the altitudinal range of species in connection with climate we must also take care to bear in mind what has been said respecting the stational range of plants, and to remember that, as we gradually ascend, not only are the sums of summer heat lowered, but that the range of station for plants also becomes gradually restricted. For instance, to recur to the adjectives employed to denote the different kinds of station, we may say, speaking in general terms, that when within our limits an altitude of 400 yards is reached, such stations as are denominated by the terms paludal, viatical, agrestal, sylvestral and septal exist no longer, and that ericetal and uliginal greatly preponderate. We see that many plants stop short of our higher altitudes, and yet ascend elsewhere to much more boreal stations than we anywhere have them. For instance, with us there are no trees, either wild or planted, above 600 yards: but in the Scotch Highlands the Juniper ascends to 900 yards, the Rowan almost as high, the Scotch Fir, Birch, Raspberry, Hazel, Gale, Aspen, Rosa villosa, and

spinosissima, and several Willows, to 500 yards and upwards, 500 yards under the more northern latitude being more than equivalent to 600 yards in Yorkshire. But in spite of this it cannot be doubted that the lowering of the number of species as we ascend has a close connection with the lowering of the sums of temperature.

*The influence of humidity upon the distribution of species.* The distribution of aerial humidity and of the rainfall over the surface of our field of study does not appear to exercise any considerable direct influence upon the topography of its flora. The paludal and lacustral plants which we have are naturally nearly all of them restricted to the vallies and the lower levels of the slopes. No doubt the greater humidity of the moorlands has something to do with the restriction to their vicinity of the characteristically Montane species, both the Flowering Plants and Ferns, and the Mosses: and tends also to bring about a greater frequency and luxuriance of many other damp and shade-loving plants. The average number of characteristically Hygrophilous plants in the floras of the drainage districts is 39 for those of the West against 45 for those of the East. Of five inland species of the Atlantic type of distribution, three are confined to the eastern, two to the western districts. Taking the flora of the eastern and western sub-provinces as a whole, the most conspicuous and essential difference between them is expressed when we say that the West has a number of plants of the higher hills which the East has not, and the East has a number of plants of the sea-shore which the West has not. The other species not common to both are not more specially damp-loving in one case than the other.

The influence upon the topography of our flora in respect of humidity exercised by the distribution of the subjacent rocks is considerable, but it is not needful to recapitulate or summarise here what has already been advanced upon this head. For what I have to say upon the matter the reader is referred to the chapter on Lithology.

*Explanation of the manner of stating the distribution of species.* We may claim as plants of North Yorkshire very nearly three out of every four of the species which inhabit the whole of Britain. This proportion applies both as regards the Flowering Plants and Ferns, and also to the Mosses. In our list of species the London Catalogue has been followed as a standard of nomenclature and arrangement, and what are there given as species are here given as species, with very trifling alteration. Occasionally, as in the case of *Callitriche verna* and *platycarpa*, I do not possess the materials for tracing out properly the distribution of two closely allied

plants as distinct from one another, and have united them for this reason. For convenience of reference a separate chapter has been devoted to each of the six principal subdivisions of Flowering Plants, but I have not thought it necessary to take up space by giving the names of the Natural Orders. The figures which precede the names of the species are intended to indicate their distribution in Britain as a whole. They refer to the types of distribution, as defined in the *Cybele Britannica*,\* as follows;

1. *British type*. Species which are more or less generally diffused throughout the whole or nearly the whole of Britain.

2. *English type*. Species which have their head-quarters in England, especially in the southern provinces, and become rare and finally cease altogether towards the north.

3. *Scottish type*. Species which, in a manner contrary to those which make up the last type, have their head-quarters in Scotland or the North of England, and become rare, and finally cease altogether southward.

4. *Highland type*. The boreal flora in a more intense degree. Species which have their head-quarters amongst the Scotch Highlands, and are only found southward in the vicinity of elevated mountains.

5. *Germanic type*. Species which have their head-quarters in the south-east of England, and run out northward and westward.

6. *Atlantic type*. Species which have their head-quarters in the south-west of England, and run out northward and eastward.

7. *Intermediate type*. Species which have their head-quarters in the south of Scotland and the north of England, and run out both northward and southward.

8. *Local type*. Species too much restricted in their range to take rank under any of the types which have been defined.

Immediately after the name of the species and the authority for the name, follows the category of citizenship to which, so far as North Yorkshire is concerned, the species seems to me properly to belong, Native, Colonist, Denizen, Alien or Incognit, as the case may be. The Alien plants of the Middlesbro' ballast hills are given by themselves in a list at the end of the enumeration of the Flowering plants.

If, as regards its distribution within our limits, the species belongs to any of the three geographical categories the plants of which stand out,

\* The classification of species under their types of distribution as given by Mr. Watson in the fourth volume of the *Cybele* (pp. 175—221) has been followed implicitly; I have given here only the primary type to which each species is referred, but in the list in the *Cybele* the normal representatives of each type are distinguished from the species which are less characteristic.

geographically speaking, in most prominent relief from the general mass of the vegetation, the word *Montane*, *Xerophilous*, *Subxerophilous*, *Maritime* or *Submaritime* next follows.

The next item in most of the paragraphs is intended to show the horizontal distribution of the species, so far as this can be done by means of the drainage districts which have been defined. If the "Area" is given as "general" the species is either reported to me upon good authority or has been seen by myself in all the nine drainage districts. Upwards of one in three of the *Native*, *Colonist* and *Denizen* species, are thus circumstanced. If a row of figures follow the word "Area" the species is only known clearly in the districts which the figures indicate. It is only the distribution of *Native*, *Colonist* and *Denizen* species which is indicated as has just been explained, not that of *Aliens*, and figures are only given where the evidence in favour of the occurrence of a species seems to me of sufficient value to be worthy of acceptance. The drainage districts are indicated by figures as follows, as in the map, and the second part of this volume.

THE DRAINAGE DISTRICTS.	
Vice counties of the Cybele Britannica.	Number and Name of District.
North West Yorkshire .. ..	{ 9 West Tees.
	{ 8 West Swale.
	{ 7 Yore.
Mid West Yorkshire (in part) ..	6 Nidd and Wharfe.
	{ 5 East Tees.
	{ 4 Esk.
North East Yorkshire .. ..	{ 3 Derwent.
	{ 2 East Swale.
	{ 1 Ouse and Foss.

Next follows such an account as I am prepared to give of the Vertical Range of the plant within our limits. C. L. stands for coast-level, and the species thus marked, except the *Submaritime* species, are those which occur with us only amongst the sandhills and cliffs of the coast-line. When a couple of numbers are given after the word "Range" the first indicates the lower limit, the second the upper limit of the species. All species which descend below 100 yards, except a few marked 50, and those which are confined to the coast-line, have their lower limit stated as 0,

and above 100 yards the limits are given in leaps of 50 yards. The upper limits above 100 yards are also given in leaps of 50 yards. Where one number only is given the ascertained vertical range of the species is under 50 yards, and that number indicates the 50 yard point to which its station or stations are nearest. By Professor Philips, the late Mr. Gray, and others, the heights of many of our prominent hills and of various points in the dales were many years ago ascertained, and now, in the recently published maps of the Ordnance Survey, we are furnished with all that can possibly be desired in this respect. In stating both upper and lower limits I have gone upon the principle of keeping within the mark. A species which occurs from the vallies upward to a height of 1900 feet has its Range given as 0-600. A considerable number of species which grow upon the Main Limestone of Micklefell at about 2500 feet are given at 0-800. In those cases where I have not myself seen the localities for a plant I have, of course, had to estimate its altitudes as well as I could, but there are very few of the higher stations that are mentioned which I have not personally examined.

In the concluding portion of the paragraph devoted to each species is described in the first place the character of the stations in which it grows, woods, grassy places, cultivated fields, &c., as the case may be; and after this is given a summary verbal outline of its distribution. The word "Vallies" is only used in the restricted sense to which allusion has been made: it covers no more than the New Red Sandstone and Kimmeridge Clay tracts of the geological map. What is said respecting the frequency of a species will of course be understood to be limited by what is said with regard to its range: a species may be thinly scattered over a wide range or abundant within a limited range, though the converse holds true usually. For many of the less frequent, or more geographically interesting species, the names of the places in the neighbourhood of which they grow are given: but it is only for the rarities that I have thought it needful to indicate special stations with any degree of minuteness. In enumerating places I have almost always begun with the north-west and proceeded towards the south-east. "On the west," if used without any qualification, means on the west of the Central Valley: "on the east" refers in the same manner. Of the books which have been consulted and the friends who have been laid under contributions for details, a table is given at the end of my list of species: but it is only for the stations of the rarer or more critical plants, where these have not been seen by myself, that authorities are quoted. A note of exclamation implies that I have seen an authentic

specimen of the plant spoken of. For plants which have been described as species, but which do not rank as such in the London Catalogue, I have endeavoured to make the list as complete as possible. In the identification of segregate species I have been materially aided by the kindness of Professor Boreau of Angers, who has not only supplied me with specimens of many of those which are described in his "Flore du Centre de la France," but has also examined and given me his opinion upon a series of the critical plants of North Yorkshire. To the liberality of Dr. Fauconnet of Geneva I am also indebted for authentic specimens of many of the species of M.M. Jordan and Reuter. But, except in the case of a few Aliens, unless a plant is treated in a separate paragraph, and unless an Alien, if it has not a separate statement of "Range" and "Area" it is never included as distinct in any numerical table or summary.



## CHAPTER XV.

### THLAMIIFLORE.

*Clematis Vitalba* L. Alien? In Cleveland in hedges near Whitby, *Middleton*! and below the Warren near Guisbro', *Mudd*! I have not seen the localities, but hesitate to accept the species as otherwise than an Alien. It is not clearly known as indigenous in Britain north of South Wales and the Severn province, and is not a plant of Denmark or Scandinavia. It is a species which is frequently planted as an ornamental shrub, and grows subspontaneously in one or two places where it has plainly been introduced, as in Duncombe Park, and the woods at the Green near Richmond.

4 *Thalictrum alpinum* L. Native. Montane. Area 9. Range 400-600. In Teesdale by the streamsides upon the plateau and the slope towards the river of Cronkley fell. Included in Fothergill's list of Wensleydale plants without any special station being mentioned.

3 *T. minus* L. Native. Area 8 5 4. Range C. L. and 500. The normal form is confined to the coast sandhills. It grows in tolerable plenty from Coatham southward by way of Marske to Saltburn. *T. calcareum* Jordan occurs sparingly upon the Main Limestone scars of Booze moor in Arkendale.

7 *T. flexuosum* Reich. Native. Montane. Area 9 6. Range 50-300. Streamsides in the western dales, rare. By the Tees opposite Holwick, and in several places lower down as far as the Greta. By the Wharfe at Thorp Arch.

2 *T. flavum* L. Native. Area 9 8 7 6 5 3 2 1. Range 0-100. Watery places in the vallies, one of the most frequent of the typically Hygrophilous species. Croft, Bedale, Kirklington, Snape, York, Thirsk, Woodend, Ainderby Steeple, Newby Wiske, Crambeck, Malton, &c. Our plant is the *T. Morisonii*, not the true *flavum* of Reichenbach and Boreau.

5 *Anemone Pulsatilla* L. Native. Xerophilous. Area 9. Range 100. About the Magnesian Limestone at Cliff wood near Pierse bridge, *Mudd*. This is its most northern station in Britain. It grows in several places upon the Magnesian Limestone terrace in West Yorkshire.

1 *A. nemorosa* L. Native. Area general. Range 0-850. Shaded and grassy places, common in the dales and amongst the hills, but comparatively rare in the more cultivated parts of the vallies. It ascends to the peak of Mickelfell.

*A. apennina* L. Alien. A native of Italy and Provence, which has been noted in a subspontaneous state about the Yore near Clifton Castle, *Mudd*: and in a wood near Beningborough Hall.

*Adonis autumnalis* L. Alien. Casually subspontaneous in cultivated fields. In Cleveland at Ayton and Crathorn, *Mudd*. Beningborough, *Hebblethwaite*.

5 *Myosurus minimus* L. Native. Area 7 6 3 2. Range 0-100. Sandy places in the Central Valley and Howardian tract, rare. Hutton Moor near Ripon, *Simpson*. Hedgebank by the side of the footpath from Thirsk to Woodend 1848. Dry banks at Holdgate, *Backhouse*! Fields south-east of Welburn, *Teesdale*.

1 *Ranunculus aquatilis* L. Native. Area general. Range 0-350. Ponds and slow streams, common in the low country. Of the segregate species *R. heterophyllus* and *Drouetii* are frequent, and *R. floribundus* and *trichophyllus* also occur.

2 *R. Baudotii* Godr. Native. Maritime. Area 5. Range C.L. Plentiful in the salt-water ditches in Coatham marshes. A slender, much branched plant, with small tripartite leaves, which grows behind the East Coatham mill, much resembles what I have from France as *R. triphyllus* Wallr.

2 *R. circinatus* Sibth. Native. Area 2. Range 100. Known to me only as growing in the fishpond below Newburgh Hall near Coxwold.

2 *R. fluitans* Lam. Native. Area 82. Range 0-150. In Gilling beck near Richmond along by Whashton, Gilling and Skeeby. In Codbeck, plentiful below Dalton and in the Swale at Topcliffe and Aisenby.

1 *R. hederaceus* L. Native. Area general. Range 0-650. Frequent in watery places, especially amongst the hills, ascending to a little tarn on the end of the fell on the north of the source of the Swale.

2 *R. caenosus* Guss. Native. Area 9 8 7. Range 350-550. Watery places in the western dales, rare. In Lunedale about the tarn on the southern slope of Mickelfell and in Gretadale near Sleightholme. In the

ditches of the peat-moss in which the Swale rises, and plentiful about the highest sheepfold. In the Yore district near the Skelgill leadmines.

1 *Ranunculus Ficaria* L. Native. Area general. Range 0-300. Damp and grassy places, plentiful throughout the Lower Zone, ascending to the rocks at the foot of Whitstoncliff.

1 *R. Flammula* L. Native. Area general. Range 0-750. Frequent in watery places, especially amongst the hills, ascending to the peak of Dodfell and the springs which issue from the Main Limestone of Mickelfell.

2 *R. Lingua* L. Native. Area 9 8 7 6 5 3 2 1. Range 0-250. Watery places, not unfrequent in the low country. Seamer Water. In the Central Valley in Halnaby Carr, Newby Carr, Ainderby Carr, Newsham Carr, about the Wiske at Yafforth, Askham bogs, Stockton forest. In Cleveland about Langbargh Stoll and in Morton Carr. In the East Swale district near Upsal and in Kilburn thicket. In the Derwent district in ponds at Hildenley, near the Derwent at Kirkham, and about Scarbro' mere.

1 *R. auricomus* L. Native. Area general. Range 0-400. Frequent in grassy and shaded places, ascending to Upper Cronkley, and the Undersert Limestone scars of Keadon.

1 *R. acris* L. Native. Area general. Range 0-800. Common in grassy places, ascending to the Main Limestone of Camfell and Mickelfell. The common plant of North Yorkshire seems to be *R. rectus* Boreau! and one which grows at the Woodhall lead mines to correspond with the French *R. Steveni*!

1 *R. repens* L. Native. Area general. Range 0-750. Common in cultivated fields and damp and grassy places, ascending to the Main Limestone of Mickelfell and above it in Gunnerside Gill and on Pin Seat.

1 *R. bulbosus* L. Native. Area general. Range 0-500. Grassy places, the commonest species of the three in the low country, but the least plentiful amongst the hills. It ascends to the limestone plateau of Keadon.

2 *R. hirsutus* Curt. Native. Area 5 3 2 1. Range 0-100. In the Central Valley in grassy places and cultivated fields at Scruton, Coatham, Thirsk, Carlton Miniott and Alne, and on the Lias at Sheriff Hutton. Apparently a Native in some of its stations, and a Colonist in others, perhaps in most of them.

1 *R. sceleratus* L. Native. Area general. Range 0-100. Watery places, frequent in the valleys, and occasionally beyond their limits, as at Masham and Pinchinthorpe.

2 *R. parviflorus* L. Native. Area 2. Range 0-100. In the Central

Valley on dry banks by the side of the footpath between Romanby and Northallerton, *Foggitt!* Reported also by Teesdale from fields in the neighbourhood of Malton.

2 *R. arvensis* L. Colonist. Area general. Range 0-250. Common in cultivated fields of the low country, ascending to the oat fields of the Hambleton plateau over Hawnby.

1 *Caltha palustris* L. Native. Area general. Range 0-750. Common in watery places, ascending to the springs which issue from the Main Limestone of Micklefell.

*Eranthis hyemalis* Salisb. Alien. A casual straggler from garden cultivation. A native of Italy and the south-west of France.

3 *Trollius europæus* L. Native. Montane. Area 9 8 7 5 4 3 2. Range 0-700. Watery places, frequent in the western dales, especially about the streams, ascending to the limestone plateau of Keasdon and the northern slope of Micklefell. In the Central Valley at Croft, Bedale, Burniston, Camphill, Aisenby, Sandhutton and Stockton-on-Tees. In the Vale of Mowbray behind Mount St. John. In Cleveland at Stokesley, and in Goathland dale and Eskdale. Amongst the eastern hills in Snailsworth, Beckdale, Wreton woods near Pickering, and the lower part of the dale of Rye. In the Howardian tract at Terrington, Wiganthorp, Hovingham and Castle Howard, and in the Vale of Pickering at Ryton Bridge.

5 *Helleborus viridis* L. Native. Xerophilous. Area 9 8 7 3. Range 50-200. About the Swale at Brompton and in a pasture at Kirby Fleet-ham. In the Yore district at Spennithorne; and about the Magnesian Limestone at Pierse bridge and Tanfield. In the dales of the eastern calcareous range in numerous stations; Rievaulx, Beckdale, Wass woods, Dowthwaite dale, Forge valley, and in the Howardian tract at Coneysthorpe, in Mowthorp dale, and at Spittle hill near Malton. A plant of the aboriginal woods of the calcareous dales, where it grows with *Actæa*, *Aquilegia*, *Melica nutans*, *Rubus saxatilis*, &c., and a characteristic example of the Xerophilous role of distribution.

5 *H. fatidus* L. Denizen. Area 2. Range 50. Apparently indigenous at Brompton near Northallerton, where it grows plentifully in Fullerker Lane and about the borders of the adjoining fields, *Wheldon!* The species occurs, but only in a subspontaneous condition, in a few other places; Camphill, Tanfield, Great Ayton, Rosedale Abbey.

2 *Aquilegia vulgaris* L. Native. Xerophilous. Area 8 7 6 3. Range 50-350. Like *Helleborus viridis* and *Actæa*, a characteristic example of the Xerophilous category. For an account of its stations see page 81.

*Aconitum Napellus* L. Alien. Subspontaneous by streamsides in a few places, but clearly a garden escape. By the Tees at Yarm, the Leven at Ayton, the Swale at Richmond, the Wharfe at Thorp Arch. Possibly indigenous in the south-west of England: clearly so in Denmark, Germany and France. Cultivated in gardens up to 300 yards.

*Pæonia corallina* Retz. Alien. In Cleveland subspontaneous or planted in Kildale woods, *Mudd!* Cultivated in gardens up to 350 yards.

*Delphinium Consolida* Angl. not L. Alien. Casually subspontaneous in cultivated fields. Thirsk, Langbargh, Pickton, Crathorn, &c.

7 *Actæa spicata* L. Native. Xerophilous. Area 8 7 6 3. Range 50-350. In the Yore district in Whitfell gill, and about a limekiln near the river at High Mains near Masham. About the Magnesian Limestone at Thornton Watlas and Thorp Arch. In the woods of the slopes of the eastern calcareous range in numerous stations: Yowlasdale, Cold Kirby, Rievaulx, Beckdale, Yedmandale, Forge valley, and in the Howardian tract at Nunnington, Hovingham and Hildenley. In its North Yorkshire distribution almost precisely the same as *Aquilegia*, and with the same vertical range. Beyond the limits of Yorkshire it is in Britain reported only from the Lake district, and that not upon recent authority. It is distributed throughout Scandinavia, and southward through Denmark, Belgium and France, to the Pyrenees.

1 *Nymphaea alba* L. Native. Area 5 3 1. Range 0-100. Ponds and streams in the vales, rare. In the ditches in the neighbourhood of the Tees at Yarm and South Stockton, in the Derwent from Malton downwards to Stamford Bridge, and in the lower part of the Foss. Occasionally planted elsewhere in ponds.

2 *Nuphar lutea* Smith. Native. Area 9 8 7 5 3 2 1. Range 0-250. In similar situations to the preceding, but more frequent and with a wider vertical range. Seamer Water, Croft, Yarm, South Stockton, Bedale, Snape, Northallerton, Thirsk, York, Malton, Scarbro', &c.

2 *Papaver hybridum* L. Colonist. Area 3 2. Range 0-100. Reported by Dr. Wasse from Thirsk and by Teesdale from the neighbourhood of Malton, but not seen recently.

1 *P. Argemone* L. Colonist. Area 8 7 6 5 4 3 2 1. Range 0-150. Frequent in cultivated fields, ascending in Wensleydale to Redmire.

1 *P. dubium* L. Colonist. Area general. Range 0-200. Frequent in cultivated fields in the low country. The common plant of North Yorkshire is authenticated by Boreau as *P. Lamottei*. *P. Lecoquii* is doubtful as a plant of our limits.

1 *Papaver Rhæas* L. Colonist. Area general. Range 0-300. Cultivated fields throughout the Lower Zone, much the commonest within our limits of the three species. The *var. strigosum* has been gathered by Mr. Moore at Acomb, and by myself at South Kilvington and between Croft and Stapleton.

*P. somniferum* L. Alien. Casually subspontaneous in waste ground, Richmond, Scarbro', &c.

6 *Meconopsis cambrica* Vig. Native? Area 7. Range 300-350. Probably indigenous in Mossdale near Hawes, where it was long ago found by Mr. Brunton; but apparently introduced in all its other stations; Aysgarth force, Woodend, Kildale woods.

2 *Chelidonium majus* L. Denizen. Area general. Range 0-250. Frequent in hedges in the low country, but always, where I have seen it, in the neighbourhood of houses or gardens. It ascends in Wensleydale to Aysgarth and Redmire, and is grown in a garden on Marrick moor at 300 yards. It is sometimes used as a medicine for cows, which perhaps may account for its being met with so often about farmhouses and villages.

2 *Glaucium luteum* Scop. Denizen. Area 5 4. Range C.L. Sandy ground near the sea, rare, probably introduced in one and possibly in both its stations. It grows near the mouth of the Tees at Middlesbro', and amongst the sand-hills near the mouth of the Esk at Whitby.

*G. violaceum* Smith. Alien. A weed in the nursery grounds at Hopton near Burniston, *Hebbkthwaite*!

*G. phæniceum* Crantz. Alien. A plant often grown in cottage gardens, which is sometimes to be met with in waste ground. Cotherstone, Ainderby Steeple, Thirsk, Rievaulx, &c.

1 *Corydalis claviculata* D.C. Native. Area 9 5 4 3. Range 50-150. Heathery places, rare. In the west about the crags of Cat castle in Deepdale. On the east in several places: hedges at Great Ayton, Eston Nab, Aislaby quarries, Bulmer hag, Wrelton woods, Langdale rigg.

*C. lutea* D.C. Alien. A species often grown in gardens, which is subspontaneous on old walls in several places. Richmond, Swinton, Tanfield, Kilton Castle, Whitby, Pickering, &c. A native of Italy and Illyria.

*C. solida* D.C. Alien. Occasionally subspontaneous as a garden escape. Norton Conyers, Wath, Thirsk, &c. A native of Scandinavia, Germany and France.

*Dielytra formosa* D.C. Alien. Subspontaneous or planted in a wood near the High force of Seamerdale, plentiful in 1859, *Wheldon*! A native of America, much cultivated in gardens.

1 *Fumaria capreolata* L. Colonist. Area 8 6 5 4 3 2 1. Range 0-150. Not unfrequent in cultivated ground and its neighbourhood in the low country. Richmond, Northallerton, Thirsk, Raventhorp, Guisbro', York, Kirkleatham, Upleatham, Whitby, Castle Howard, Scarbro'. The common plant of North Yorkshire is authenticated by Boreau as *F. Boræi* and *F. pallidiflora* also occurs. The true *F. muralis* I do not know as a plant of the Riding, and *F. confusa* as a ballast plant only.

1 *F. officinalis* L. Colonist. Area general. Range 0-250. Common in cultivated fields amongst the vales and slopes.

5 *F. parviflora* Lam. Colonist. Area 3. Range 50. Gathered in 1858 by Mr. W. Bean, junr., in cultivated fields in the Vale of Pickering, near Seamer. Abundant there in 1862.

5 *F. Vaillantii* Lois. Colonist. Area 3. Range 100. Gathered in the summer of 1858 by a party from Thirsk, of which I was one, in a vetch field below Cawton heights near Hovingham.

1 *Cakile maritima* Scop. Native. Maritime. Area 5 4 3. Range C.L. Plentiful amongst the salt marshes at Middlesbro' and Coatham: more sparingly along the coast-line southward by way of Marske, Saltburn, Sandsend, Whitby and Scarbro'.

2 *Crambe maritima* L. Native. Maritime. Area 5 4. Range C.L. Sparingly on the sands at Coatham, *Flora*. Huntcliffe, *Ferguson*. On the cliff at Whitby, *Brunton*.

*Coronopus didyma* Smith. Alien. Waste ground near the sea at Cargfleet, *Mudd*! Reported also by Robson from Scarbro'. Considered by A. De Candolle as a plant introduced into Europe from Temperate America.

2 *C. Ruellii* Gaertn. Native. Area 8 7 6 5 4 3 2 1. Range 0-200. Not unfrequent by roadsides and in waste ground in the low country. Richmond, Leyburn, Bedale, Camphill, Thirsk, York, Middlesbro', Guisbro', Great Ayton, Coatham, Sandsend, Whitby, Terrington, Scarbro', &c. It ascends to the eastern extremity of Leyburn Shawl.

1 *Thlaspi arvense* L. Colonist. Area 8 7 5 4 3 2. Range 0-200. Cultivated fields in the low country, rare. Richmond, Leyburn, Camphill, Guisbro', Hutton Rudby, Thirsk, Hovingham, Castle Howard, &c.

7 *T. alpestre* L. Native. Montane. Area 8 7. Range 250-500. Abundant about the Hind Rake and Copperthwaite lead mines near Reeth. It is also reported by Mr. Ward from Hirst head, and I have seen it sparingly with *Armeria* at Woodhall. This leadmine plant, in North Yorkshire as at Malham, is all *T. occitanum* *Jordan*. The plant which grows in the fir plantation on the Durham side of the Tees at Winch bridge is

authenticated by Boreau as *T. sylvestre*.

1 *Capsella Bursa pastoris* L. Native. Area general. Range 0-400. Common in cultivated fields and waste ground, ascending to Upper Cronkley and Sleightholme.

7 *Hutchinsia petraea* R. Br. Native. Montane. Xerophilous. Area 87. Range 200-500. Not unfrequent amongst the limestone scars of the western dales. In the West Swale district on Copperthwaite scars and other places about Reeth and Hirst. In the Yore district from Hawes eastward to Aysgarth in several places; the Buttertubs pass, Addleburgh, Seamerdale, and descending to walls at West Burton.

2 *Tesdalia nudicaulis* R. Br. Native. Area 731. Range 0-300. Rare in sandy ground, but with a comparatively wide vertical range. Amongst the flagstone quarries of Leyburn moor, with *Arenaria tenuifolia*. Hutton moor near Ripon, Dalton! Fields near Alne, Peirson. Walls on the Newburgh side of Yearsley moor, Ibbotson. Fields at Bulmer, Teesdale.

*Iberis amara* L. Alien. An occasional straggler from garden cultivation. Cultivated up to 350 yards.

2 *Lepidium latifolium* L. Denizen. Area 54. Range 0-100. Hedgebank between Yarm and High Worsall, T. J. Foggitt! Redcar, Leese. Coast cliffs between Redcar and Sandsend, Flora.

*L. Draba* R. Br. Alien. Besides its occurrence at Middlesbro' this species was found by Mr. Edwin Lees in waste ground upon the Cliff at Whitby. It is a native of the South of Europe.

1 *L. campestre* R. Br. Native. Area general. Range 0-250. Frequent in sandy fields and upon dry banks, ascending in Wensleydale to Appersett bridge.

1 *L. Smithii* Hook. Native. Area 7542. Range 0-100. In similar situations to the preceding, but less frequent and not ascending so high.

*L. rudérale* L. Alien. Scarbro' old pier, Middleton! Reported also from Coatham marshes, which I have often searched without seeing it.

*L. sativum* L. Alien. An occasional straggler from garden cultivation. Cultivated up to 500 yards.

1 *Cochlearia officinalis* L. Native. Area 9876543. Range 0-800. Common along the coast-line from Stockton-on-Tees to Scarbro'. Inland amongst the western hills it is not unfrequent. It ascends to the peak of Great Whernside and the Main Limestone of Mickelfell, and like Myrrhis, descends with the streams into the Central Valley. So that it has, in fact, a widely diffused "Montane" superadded to a "Maritime" role of



distribution. *C. anglica* and *C. danica* I do not know as growing within our limits.

*Armoracia rusticana* Baumg. Alien. Commonly grown in gardens and occasionally subspontaneous in waste ground. It is well established by the side of Codbeck between Dalton and Topcliffe bridge.

4 *Draba incana* L. Native. Montane. Subxerophilous. Area 9 8 7. Range 350-800. Frequent amongst the calcareous scars of the western dales. In the West Tees district on Cronkley Scars, the Sugar Limestone of Cronkley fell, the Main Limestone of Micklefell and Gilmanscar. In the West Swale district plentiful on the scars of Booze moor and both upon the northern and western slope of Keadon. Hell Gill. In the Yore district upon the cliffs of Widdale fell, Stag's fell, Addleburgh, Seamerdale, Waldendale, &c.

1 *D. verna* L. Native. Area general. Range 0-800. Common upon walls and dry banks, ascending to the Main Limestone of Askrigg moor and Micklefell. The common plant of North Yorkshire is *Erophila majuscula*, Jordan!. *D. præcox*, Stev., *E. brachycarpa* Jordan! grows upon walls of calcareous gritstone at Scauton and Rievaulx: and a plant closely allied to the Breadalbane *D. inflata*! upon walls in the Vale of Mowbray at Westow.

*Camelina sativa* Crantz. Alien. Not unfrequent as a casual weed in cultivated fields, especially of flax. The common plant of North Yorkshire is true *C. sativa*, but *C. dentata* Pers. also occurs.

2 *Alyssum calycinum* L. Colonist. Area 8 7 6 5 3 2. Range 0-200. Not unfrequent in cultivated fields, especially in the sandier portions of the Central Valley. Wath, Kirklington, Nether Poppleton, Acomb, Thirsk, Woodend, Carlton Miniott, Northallerton, Great Ayton, Ganthorpe, &c. The highest station in which I have seen it is the plateau of the calcareous hills above Rievaulx.

1 *Cardamine amara* L. Native. Area general. Range 0-300. Frequent in watery places in the Lower Zone, ascending to Holwick and Hawes.

1 *C. pratensis* L. Native. Area general. Range 0-800. Common in damp and grassy places, ascending to the Main Limestone of Micklefell.

1 *C. hirsuta* L. Native. Area general. Range 0-800. Common upon banks and rocks, with the same vertical range as the preceding. *C. sylvatica* Link is frequent in shaded woods, especially in the dales.

*C. impatiens* L. Incognit. Reported by Teesdale from the neighbourhood of Richmond, but not seen recently.

1 *Arabis thaliana* L. Native. Area general. Range 0-500. Frequent upon walls and dry banks, ascending to Hell gill and the Main Limestone scars of the Buttertubs Pass.

*A. petraea* Crantz. Incognit. Reported from rocks upon the slope below Whitstoncliff, apparently in error for *Cardamine hirsuta*.

1 *A. hirsuta* R. Br. Native. Subxerophilous. Area 9 8 7 6 3 2. Range 50-500. Frequent upon the limestone scars of the western dales, ascending to Cronkley Scars and the Main Limestone cliffs of Punchard's gill and Booze moor. About the Magnesian Limestone at Tanfield and Thorp Arch. In the Central Valley at Bedale, Kirklington, Acomb and Sowerby. On the east in many places amongst the calcareous hills and Howardian tract, also on sandstone walls at Coxwold, Newburgh and Upsal Castle.

5 *Turritis glabra* L. Native. Area 8 2. Range 0-100. Sandy fields in the Central Valley in several places. Catterick Bridge, Brompton on Swale, Kirklington, Leeming Lane, Leckby, Helperby, Skipton Bridge, Carlton Miniott, &c.

1 *Barbarea vulgaris* R. Br. Native. Area general. Range 0-250. Common in watery places in the low country, ascending to Cotherstone and Bolton Castle. *B. arcuata* occurs occasionally, and a form which might easily be mistaken for the following, and which is probably the *var. sylvestris* of Fries, grows along with it on Clifton Ings.

2 *B. stricta* Fries. Native. Area 6 1. Range 0-100. With the preceding about the Ouse along Clifton Ings and in other places in the neighbourhood of York, where it was discovered by Mr. Borrer. Reported by Mr. Simpson from Leeming Lane, but I have not seen specimens. A species widely diffused upon the Continent, but which is singularly local in Britain.

7 *B. intermedia* Boreau! Colonist. Area 3. Range 100-150. This species I have seen but in one place and that only quite recently. I met with it in 1862, in cultivated fields at the lower end of Bilsdale, on the slope of Easterside towards Hawnbly.

*Barbarea præcox* R. Br. Alien. Casually subsontaneous in waste ground. Richmond, Wensley, Camphill, Welburn, &c.

1 *Nasturtium officinale* R. Br. Native. Area general. Range 0-350. Common in ditches and slow streams, ascending to the moor above Preston-under-scar.

2 *N. terrestre* R. Br. Native. Area 9 8 5 3 2 1. Range 0-100. Damp places, not unfrequent in the vales, and occasionally beyond their

limits. Burton Constable, Sheriff Hutton, Ganthorpe, Terrington &c.

2 *Nasturtium sylvestris* R. Br. Native. Area 8 7 6 3 2 1. Range 0-100. Watery places, frequent in the vales and occasionally beyond their limits. Banks of the Swale, Wiske, Ouse, Foss and Derwent. In Cleveland at Newton and in Coatham marshes.

2 *N. amphibium* R. Br. Native. Area 8 3 2 1. Range 0-100. Watery places, frequent in the damper parts of the vales.

1 *Sisymbrium officinale* L. Native. Area general. Range 0-250. Common along roadsides and in waste ground in the low country, ascending in Swaledale to High Fremington, in Wensleydale to Aysgarth.

2 *S. Sophia* L. Native. Area 8 7 5 3 2. Range 0-150. In similar situations to the preceding, but much less frequent. Brompton on Swale, Wensley, Fencote, Carthorpe, Nosterfield, Thirsk, Middlesbro', Malton, Scarbro', &c.

*Erysimum cheiranthoides* L. Alien. Occasionally subspontaneous in cultivated fields and waste ground. Leeming, Masham, Well, Thirsk, Hovingham, Terrington, &c. *E. virgatum* has been met with by Mr. Ward in Swaledale between Reeth and Marriek.

1 *E. Alliaria* L. Native. Area general. Range 0-250. Common upon shaded banks in the low country, ascending in Swaledale to the foot of the Red Scar near Downholme, and in Gretaedale to Gilmonby near Bowes.

*Choiranthus Choiri* L. Alien. Occasionally subspontaneous or planted on old walls. Rokeby Castle, Mortham's Tower, Richmond Castle, Redmire, Jerveaux abbey, Tanfield church, Danby Castle, St. Mary's Abbey and Clifford's Tower at York, &c. Indigenous in Greece and the south-west of Europe.

*Hesperis matronalis* L. Alien. Occasionally subspontaneous by stream-sides and in waste ground. Lonton, Lartington, Richmond, Aysgarth, Wensley, Hutton Conyers, Rievaulx, &c. Grown in gardens up to 350 yards.

6 *Brassica oleracea* L. Denizen. Area 4. Range C.L. Huntcliffe, Ferguson. Plentiful amongst the coast precipices in the vicinity of Staithes, whence it is recorded in the original Botanist's Guide by Archdeacon Peirson, and where it is not unlikely to be indigenous. It occurs in more suspicious stations near Whitby and Scarbro', and is an occasional weed of cultivated fields inland. It is grown up to 500 yards, but will not stand the winters of our Middle zone.

2 *B. Napus* L. Colonist. Area general. Range 0-300. Cultivated

throughout the Lower zone and frequently subspontaneous by streamsides &c. Apparently indigenous in Scandinavia and Russia.

2 *Brassica Rapa L.* Colonist. Area general. Range 0-300. Cultivated up to 500 yards, but like all the other cultivated crops, only grown casually above 400 yards. Upon the heavy soils of the Lias and Gritstone the Turnip and Oat are more profitable and successful than anything else. Like the preceding, it is frequent in a subspontaneous state in cultivated fields and along streams, and for its original home we must probably look in the same direction.

1 *Sinapis arvensis L.* Colonist. Area general. Range 0-350. One of the commonest weeds of cultivated fields, and ascending as high as field cultivation reaches.

2 *S. alba L.* Colonist. Area 9 8 7 6 5 3 2. Range 0-200. Occasionally grown in fields and gardens up to 500 yards, and sometimes occurring as a weed. The highest point where I have seen it in a subspontaneous state is Redmire in Wensleydale.

2 *S. nigra L.* Colonist. Area 7 6 5 4 2 1. Range 0-200. Occasionally cultivated, and also an occasional weed of cultivated fields and waste ground. Perhaps a native on the coast at Baytown (Robin Hood's Bay).

2 *S. tenuifolia L.* Denizen. Area 8 5 4 3 2. Range 0-100. Along the coast plentiful about Middlesbro' and Coatham, and rarer southward about Whitby and Scarbro'. Inland in a field between Newby Wiske and Kirby Wiske, upon a hedgebank at Thirsk, upon the railway embankment at Guisbro', and in the limestone quarries at Malton. Probably a genuine native of North Yorkshire.

2 *S. muralis L.* Denizen. Area 5 4. Range C.L. Along the coast in waste ground about Middlesbro' and Coatham, and by the side of the Esk below Ruswarp. In this latter station it was first noted by Mr. Edwin Lea.

1 *Raphanus Raphanistrum L.* Colonist. Area general. Range 0-350. Not so common as *Sinapis arvensis*, but like that species a weed of cultivated fields, and ascending as high as field cultivation reaches. *Raphanistrum arvense Reich.* is not unfrequent.

1 *Reseda luteola L.* Native. Area general. Range 0-200. Frequent in dry places, ascending to the plateau of the calcareous range over Rievaulx.

2 *R. lutea L.* Native. Area 7 6 5 4 3 2 1. Range 0-100. In similar situations to the preceding, but less frequent. More abundant about Middlesbro' and along the coast line to Coatham than anywhere else within our limits.

*Reseda fruticulosa* L. Alien. A casual straggler from garden cultivation. Wall near Richmond mill, *Ward*. Rye bank between Nunnington and West Ness, *Ibbotson*. Indigenous in France and the south of Europe.

1 *Helianthemum vulgare* Gaertn. Native. Xerophilous. Area 9 8 7 6 5 4 3 2. Range 0-700. Frequent amongst the calcareous hills on both sides of the Central Valley, ascending to the limestone edges of the northern slope of Micklefell. About the Magnesian Limestone at Thorp Arch and in the Yore district. In the Central Valley at Burniston and in Cleveland between Crathorn and Hutton Rudby. On the coast at Saltburn.

7 *H. canum* Dun. Native. Xerophilous. Area 9. Range 600. With the preceding and *Hippocrepis* plentiful on the sugar limestone of Cronkley fell.

1 *Viola palustris* L. Native. Area 9 8 7 5 4 3 2. Range 0-700. Frequent in swamps amongst the hills, ascending to the slope of Micklefell towards Cronkley. Occasionally in the Central Valley, as at Halnaby Carr, and with *Lysimachia thyrsiflora* at Carlton Carr.

2 *V. odorata* L. Native. Area general. Range 0-150. Frequent in shaded places in the low country, ascending to Beckdale woods and in Swaledale to Fremington. Clearly indigenous in many of its localities, but no doubt sometimes an introduction. Our White Violet is a mere form of this species and is not *V. alba* Besser.

2 *V. hirta* L. Native. Subxerophilous. Area 9 8 7 6 5 4 3 2. Range 0-300. Frequent amongst the calcareous hills on both sides of the Central Valley, ascending to Winch bridge, Preston Scar, Leyburn Shawl and Hawnby bank. About the Magnesian Limestone at Thorp Arch. In the Central Vale at Kirklington and Northallerton. On the basaltic ridge at Langbargh. Amongst the coast sandhills at Coatham, and on the east in a few other places apart from the hills, as Knayton, Hood grange, Mowthorpe dale, &c. *V. sepicola* Jordan occurs on sandy banks near Tanfield hall and by the Yore side in the same vicinity, and most likely some of the other numerous intermediates between this and the preceding are also to be met with.

1 *V. sylvatica* Fries. Native. Area general. Range 0-800. Common both in shaded and exposed grassy places, ascending to the Main Limestone of Cam fell, Widdale fell and Micklefell. This range is that of *V. Riviniana* Reich. *V. Reichenbachiana* Jordan occurs in shaded places in the vales and low country, but I have not seen it above 150 yards.

1 *V. flavicornis* Smith. Native. Area 8. Range 50. Known to me only as growing in the carr by the side of the Wiske opposite Newby Wiske, where it was found by Mr. Umpleby.

1 *Viola tricolor* L. Native. Area general. Range 0-350. Common in cultivated fields from the vales upwards as high as field cultivation reaches. It would perhaps range better with the Colonists than the Natives, but it grows occasionally in woods, as at Newburgh and Carlton Carr. The three cornfield Pansies of the neighbourhood of Thirsk were referred by Professor Boreau, one to *V. contempta* Jordan, the two others doubtfully to *V. Lloydii* and *V. peregrina*. The latter I have seen in one place only, the two others are common.

3 *V. lutea* Huds. Native. Montane. Area 9 8 7 3 2. Range 150-800. Frequent in grassy places amongst the western hills and dales, ascending to the Main Limestone of Mickelfell and the plateau of Pin seat, descending in Teesdale to Lonton, and in Swaledale to the Swale side at Applegarth. It was formerly found in the Central Vale at Kirby hill near Boroughbridge, but has been extinct there since 1823. Rare amongst the eastern moorlands: Kewwick Nab, Seamer Moor. A curious plant (*var. hamulata* MSS.) with small yellow flowers, petals standing forward as in the cornfield *V. arvensis*, and stipules with sickle-shaped lateral and crenate leafy terminal lobes, which grows upon the Richmond race-course, and with *Thlaspi occitanum* in the neighbourhood of Reeth, does not appear to be essentially distinct.

1 *Drosera rotundifolia* L. Native. Area 9 8 7 5 4 3 2 1. Range 0-750. Frequent in heathery bogs from the vale heaths upwards to the peaks of Lovely Seat and Nine Standards, and the springs which issue from the Main Limestone of Mickelfell.

2 *D. intermedia* Hayne. Native. Area 3 1. Range 0-100. Frequent amongst the sandy heaths of the Central Valley: Stockton forest, Stren-sall Common, Pilmoor: and more sparingly in the Howardian tract on Slingsby Moor and Terrington Carr.

3 *D. anglica* Huds. Native. Montane. Area 8 5 3. Range 0-300. In the Central Valley plentiful with *Scheuchzeria* in Leckby Carr. In Cleveland on Battersby moor, *Mudd*. In the Howardian tract in Terrington Carr, where it was first noted by Teesdale.

1 *Polygala vulgaris* L. Native. Area general. Range 0-600. Common in grassy places, ascending to the plateaux of Pin seat and Cronkley fell. *P. depressa* Wender. is frequent upon heaths.

7 *P. austriaca* Crantz. Native. Montane. Area 9. Range 550-600. (See page 101). In Teesdale this species grows sparingly upon the banks of the eastern fork of the streamlet which forms the White Force. It was discovered there by the Backhouses in 1852, and ten years later they

have met with it upon one of the sugar limestone hillocks of the Cronkley plateau. Although so widely diffused upon the Continent these are the only known British localities.

2 *Dianthus deltoides* L. Native. Area 3. Range 100. This is our only indigenous species, and it is known in one station only, a dry gravelly place called the Coom, situated about half-a-mile south of Terrington, where it was found by Mr. Ibbotson. *D. barbatus* and *D. plumarius* are both upon record as plants of the Ainsty, but they grow only where they have been planted in the grounds by the Wharf side above Thorp Arch.

2 *Saponaria officinalis* L. Denizen. Area 9 8 6 5 3 2 1. Range 0-100. By the Tees side at Dalton, Worsall and Yarm. On the castle bank at Richmond, and along the Swale and Ouse in numerous places as far down as York. On the castle hill at Scarbro'; also in many other places in fields and upon hedgebanks: Crathorn, Hutton Rudby, Kirklington, Northallerton, Kirby Wiske, Thirsk, Acomb, Malton, &c. Probably indigenous in some of its stations; but no doubt introduced in others.

*S. Vaccaria* L. Alien. Sent to me by Mr. Bean from Scarbro', where it has once been found in a cultivated field.

1 *Silene inflata* Sm. Native. Area general. Range 0-300. Frequent upon dry banks and about roadsides throughout the Lower Zone. *S. puberula* Jordan is not unfrequent.

1 *S. maritima* With. Native. Submaritime. Area 8 5 4. Range C. L. 250-300. Rare with us as a maritime plant. It has been met with in Coatham marshes and upon the sea bank between Marske and Saltburn. Inland it grows upon the Red Scar near Downholme, where it was originally found by Mr. Ward, so that, like *Plantago maritima* and *Armeria*, it has a Montane superadded to a Maritime role of distribution.

*S. Otites* L. Incognit. There is a specimen in the Middleton herbarium from East Moors near Castle Howard, but the plant has not been seen there recently.

2 *S. anglica* L. Colonist. Area 3 2. Range 0-100. This species has been found as a weed of cultivated fields near Terrington by Mr. Spruce, and at different times by the Messrs. Foggitt and myself about Thirsk and Sandhutton, but it is much less frequent than the following.

2 *S. noctiflora* L. Colonist. Area 8 6 5 4 3 2 1. Range 0-150. Not unfrequent in cultivated fields at a low level. Richmond, Bedale, Thorp Arch, Leckby, Redcar, Saltburn, Acomb, Thirsk, Bulmer, Castle Howard, Hutton Bushel, &c.

*Silene Armeria L.* Alien. A casual straggler from garden cultivation. Bedale, Thirsk, &c. Indigenous in France and Germany.

1 *Lychnis Floscucli L.* Native. Area general. Range 0-400. Common in damp places amongst the vales and hills.

1 *L. diurna Sibth.* Native. Area general. Range 0-450. Common in shaded places, ascending in the West Swale district to Whitstondale scars.

1 *L. vespertina Sibth.* Native. Area 8 7 6 5 4 3 2 1. Range 0-200. Common upon roadsides and in cultivated fields in the low country. A plant is not unfrequent which looks like a hybrid between this and the preceding.

1 *L. Githago Lam.* Colonist. Area general. Range 0-300. Frequent in cultivated fields, ascending in Swaledale to Muker.

1 *Sagina procumbens L.* Native. Area general. Range 0-800. Common upon walls, roadsides and in damp places, ascending to the Main Limestone of Micklefell.

1 *S. maritima Don.* Native. Maritime. Area 5. Range C.L. Amongst the Coatham salt marshes, and in dry sandy ground in the same neighbourhood.

2 *S. apetala L.* Native. Area general. Range 0-300. Common upon walls and in dry places throughout the Lower zone, ascending to the flagstone quarries of Leyburn moor.

2 *S. ciliata Fries.* Native. Area 6 3. Range 0-100. In similar situations to the preceding, but very rare. Sparingly with *Ornithopus* in the lane leading from Acomb towards the Ouse. This plant is more robust in its habit of growth than Jordan's figure and my continental specimens of *S. patula*, but I do not think it is essentially distinct. M. Boreau refers it to *S. ambigua Lloyd*. Dr. Carrington sends from Scarbro' what appears to be the normal plant.

3 *S. rubulata Wimm.* Native. Area 3. Range 150. This species has been reported to me as having been found on Hutton Bushel moor by Messrs. Jobson and Deane of Hutton Bushel.

1 *S. nodosa Meyer.* Native. Area general. Range 0-600. Found in all the districts and with a wide vertical range, but yet not anywhere plentiful. Amongst the western hills it grows principally in swamps and about the streams. It ascends to the plateau of Cronkley fell, and about as high on Widdale fell, and descends with the Tees to Blackwell, the Swale to Catterick bridge, and the Yore to Tanfield and Hutton Conyers. It occurs also in Skeeby marsh and near Bedale, and is frequent amongst



the sandy heaths of the Central Vale and Howardian tract, and grows also upon the Hambleton hills, Silpho moor and the coast sandhills at Coatham and Saltburn.

1 *Spergula arvensis* L. Colonist. Area general. Range 0-350. Common in cultivated fields and waste ground, ascending as high as field cultivation reaches.

1 *Honckeneja peploides* Ehrh. Native. Maritime. Area 5 4 3. Range C.L. Amongst the coast sandhills common at Middlesbro', Coatham and Redcar: rarer southward at Sandsend, Whitby and Scarbro'.

1 *Spergularia media* Angl. Native. Maritime. Area 5 4 3. Range C.L. Plentiful amongst the salt marshes at Middlesbro' and Coatham: and occurring also by the side of the Esk at Whitby and on the north shore at Scarbro'. Our plant is the *Lepigonum neglectum* of Kindberg. The true *L. marinum* I do not know as occurring within our limits.

1 *S. rubra* St. Hilaire. Native. Area 7 3 1. Range 0-200. Sandy heaths, rare. It has been met with upon Hutton moor (between Ripon and Dishforth), Strensall common, Yearsley moor, and Hutton Bushel moor near Hackness.

1 *Arenaria serpyllifolia* L. Native. Area general. Range 0-650. Common upon dry banks, ascending to the Main Limestone of Askrigg moor and Widdale fell. This refers to *A. sphaerocarpa* Tenore. *A. leptoclados* Gussone is frequent, occurring principally in sandy cultivated fields, and ascends to the flagstone quarries of Leyburn moor (300 yards): and *A. Lloydii* Jordan grows upon the castle hill at Scarbro'.

2 *A. tenuifolia* L. Native. Area 7 3. Range 100-300. In tolerable plenty in company with *Teesdalia* and *A. leptoclados* amongst the flagstone quarries of Leyburn moor. The species is also reported by Teesdale from Barton heights near Castle Howard.

7 *A. verna* L. Native. Montane. Subxerophilous. Area 9 8 7. Range 150-800. Frequent amongst the western hills and dales, but although this is the case, it is quite absent from those which lie on the east of our Central Valley. It ascends to the Main Limestone of Micklefell and Widdale fell, and is especially plentiful about the lead mines of the western dales, as for instance those of Gunnerside Gill, Arkendale, Woodhall and Preston-under-scar. In Swaledale it descends to Reeth, and with *Viola lutea* to Applegarth. I have had the Continental *A. laricifolia* sent to me as *A. verna* localised from the Yore side at Hutton Conyers.

1 *A. trinervis* L. Native. Area general. Range 0-300. Frequent upon shaded banks, ascending in Teesdale to Mickleton, and in the Yore district to Counterside in Seamerdale.

3 *Stellaria nemorum* L. Native. Montane. Area 9 8 7 6 3 2. Range 50-400. Streamsides and damp woods in the dales, one of the most frequent of the characteristically Montane species. In Teesdale it does not ascend above Winch bridge, but it occurs not only in the main dale, but also in Balderdale and Gretadale, and lower down the Tees as far as Pierce bridge, Croft and Dalton. In Swaledale it grows in Applegarth woods, and in the Yore district it ascends to the woods of Fossdale and Whitfell gill, and descends the river to Tanfield. By the Wharfe side it grows near Thorp Arch: in the Central Valley at Kirklington: and on the east in Whitstoncliff and Coxwold woods, in the dale of the Rye and in several stations in the Howardian tract. Its distribution is nearer to that of *Trollius* than any other species, and in their diffusion the two are only below *Myrrhis* and *Crepis paludosa* of the Montane species.

1 *S. media* L. Native. Area general. Range 0-650. Shaded and waste places, everywhere common except in the heathery tracts. The highest place in which I have seen it is near a shepherd's hut on the ridge that runs from the peak of Nine Standards towards the source of the Swale: the next highest near a shooting box on the Main Limestone of Askrigg moor. *S. neglecta* Weihs is frequent in shaded places. *S. Boræana* Jordan! I have gathered in Coatham marshes, and a variety (*var. brachypetala* MSS.) intermediate between this and typical *S. media* at Sowerby near Thirsk.

1 *S. Holostea* L. Native. Area general. Range 0-350. Common in shaded places, ascending in Swaledale to Keld, in Arkendale to Shaw wood.

2 *S. glauca* With. Native. Area 9 8 6 4 3 2. Range 0-150. Watery places, not unfrequent in the low country.

1 *S. graminea* L. Native. Area general. Range 0-500. Frequent in damp and shaded places, ascending to the edge of Askrigg moor.

1 *S. uliginosa* Murr. Native. Area general. Range 0-800. Frequent in damp places, ascending to the peak of Lovely Seat and the Main Limestone of Micklefell.

2 *Cerastium aquaticum* L. Native. Area 8 6 5 3 2 1. Range 0-100. Frequent in watery places in the Central Valley. Banks of the Tees, Swale, Wiske, Codbeck, Ouse, Foss, &c.

1 *C. glomeratum* Thuill. Native. Area general. Range 0-350. Frequent in grassy and cultivated places throughout the Lower zone, ascending to Keld and the village of Cotterdale.

1 *C. triviale* Link. Native. Area general. Range 0-800. Grassy

places, common, ascending to the peaks of Great Whernside and Nine Standards, and the Main Limestone of Micklefell.

1 *Cerastium semidecandrum* L. Native. Area 8 7 6 5 4 3 1. Range 0-300. Not unfrequent in dry sandy ground throughout the Lower zone. On the west it ascends to the flagstone quarries of Leyburn Moor and the Main Limestone of Leyburn Shawl. In the Central Vale it grows at Brompton-on-Swale, Topcliffe and about the Stockton and Strensall heaths: and in the Howardian tract at Yearsley and Terrington. In Cleveland it is a plant of the basaltic dike and coast sandhills.

1 *C. tetrandrum* Curt. Native. Maritime. Area 5 4. Range C.L. With the preceding amongst the coast sandhills at Coatham, Redcar, Marske and Whitby.

1 *C. arvense* L. Native. Subxerophilous. Area 9 8 7 6 5 3 2 1. Range 0-250. Dry banks, one of the most frequent of the characteristically xerophilous species. Besides its stations amongst the lower levels of the calcareous tracts it is plentiful amongst the coast sandhills, and occurs in many of the drier parts of the Central Vale, especially by the streamsides, as for instance by the Tees between Croft and Dalton, the Swale at Sandhutton and Topcliffe, and the Ouse along Clifton Ings. It is allied in its distribution to *Anthyllis Vulneraria*, but does not ascend so high.

*Linum usitatissimum* L. Alien. Occasionally cultivated in the Lower zone, and to be met with casually in a subspontaneous state. Linton-on-Ouse, the Lintune of the Domesday book, is said to derive its name from the plant, so that it would seem that its growth is of ancient date.

5 *L. perenne* L. Native. Xerophilous. Area 7. Range 250. In the Yore district in the western edge of Leyburn Shawl, *Ward!* Reported also by Teesdale from fields at Bulmer.

*L. angustifolium* Huds. Incognit. Reported by Brunton from the neighbourhood of Malton, but not seen recently.

1 *L. catharticum* L. Native. Area general. Range 0-700. Common upon sandy and grassy banks, ascending to the Main Limestone of Booze moor and Widdale fell, and the limestone edges of the northern slope of Micklefell.

1 *Radiola Millegrana* L. Native. Area 7 3 2 1. Range 0-150. Frequent amongst the sandy heaths of the Central Vale and Howardian tract: Stockton forest, Strensall common, Hutton moor, Coulton moor, Terrington Carr, &c. Also on walls at Thirsk, Romanby and Coxwold.

1 *Malva moschata* L. Native. Area general. Range 0-300. Not

unfrequent upon dry banks throughout the Lower zone. Croft, Cleasby, Ravensworth, Fremington, Applegarth sears, Richmond, Preston sear, Leyburn Shawl, Bedale, Leeming, Thorp Arch, Hutton Rudby, Kilton, Castleton, Whitby, Thirsk, Castle Howard, Hovingham, Pickering, &c. The least plentiful of the three species in the low country but yet with the widest vertical range.

1 *Malva sylvestris* L. Native. Area general. Range 0-250. Common in waste ground and along roadsides, ascending to Kewick and Leyburn, and grown in gardens up to 300 yards in the dales.

2 *M. rotundifolia* L. Native. Area general. Range 0-200. Frequent in similar situations to the preceding, ascending Wensleydale to Redmire.

2 *Tilia parvifolia* Ehrh. Native. Area 3. Range 100-200. I have seen this species only in one place in an indigenous state, and that is at Slip gill near Rievaulx, where aboriginal woods, composed principally of Oak and Hazel, cover the steeply-sloping rocky banks of one of the loneliest and pleasantest glens of the eastern calcareous range. As a planted tree it occurs within our limits occasionally, and *T. intermedia* as a planted tree is frequent. I have seen both of them up to 350 yards.

2 *T. grandifolia* Ehrh. Native. Area 8. Range 100-250. Mr. Ward considers this species to be truly indigenous amongst the limestone sears of the lower part of Swaledale. He writes—"The wood (where it occurs) near the Round Howe is a rocky wood and without any planted trees. At Clink Bank also it grows from the clefts of the rock in a very precipitous place, where no trees can well have been planted. In both places I should say that it is perfectly indigenous. Near the Round Howe it is plentiful. At Clink Bank there are three or four trees, with innumerable young shoots growing from the bottom out of the rocks, and *Galium boreale* grows upon the rock within twenty yards of it." As a planted tree the species is not unfrequent. It is recorded by Mr. R. B. Bowman from West Burton in Bishopdale, but the details respecting this station are not stated. There is a noble avenue of Limes in Thirkleby Park near Thirsk, which includes all the three species.

2 *Hypericum Androsæum* L. Native. Area 8 4 3. Range 0-100. Woods and hedgebanks in the low country, rare. In the Central Valley it grows in the neighbourhood of Sinderby, and in the lane between Mawnby and Kirby Wiske. Near the Cleveland coast it grows at Kilton and in the woods of Larpool and Hawsker, and it has also been gathered by Mr. Reynolds near Hackness.

1 *H. perforatum* L. Native. Area general. Range 0-300. Common

upon banks and along the sides of streams throughout the Lower zone, ascending in Teesdale to Winch bridge. The commonest species of the open low country.

1 *Hypericum dubium* Leers. Native. Area 9 8 7 6 3. Range 0-250. In similar stations to the preceding, but much less frequent. Ascending in Teesdale to Middleton, *Flora*.

1 *H. quadrangulum* L. Native. Area general. Range 0-400. Frequent in watery places amongst the vales and hills, ascending in the Yore district to Fossdale woods, and as high on Gale moss.

1 *H. humifusum* L. Native. Area general. Range 0-300. Frequent upon sandy and grassy banks throughout the Lower zone.

1 *H. pulchrum* L. Native. Area general. Range 0-550. Frequent upon heathery banks from the vales upwards to the scars of Bleabeck and Cronkley. The commonest species of the heathery tracts.

1 *H. hirsutum* L. Native. Area general. Range 0-450. Frequent in woods and upon hedgebanks, ascending to the Main Limestone scars of Keld and Harlen fell. The commonest species of the calcareous glens and dales.

2 *H. montanum* L. Native. Xerophilous. Area 6 3 2. Range 50-200. About the Magnesian Limestone at the quarry above Thorp Arch. In the Vale of Mowbray between Coxwold and Thirkleby. Amongst the woods of the eastern calcareous range in several places; Flazendale, Beckdale, Hackness, &c., and in the Howardian tract in Hovingham and Gilla leys woods.

2 *H. elodes* L. Native. Area 4 3 2 1. Range 0-250. Frequent amongst the heaths of the Central Vale and Howardian tract: Pilmoor, Stockton forest, Strensall common, Scakleton moor, Slingsby moor, &c. Amongst the eastern arenaceous hills in Sleddale and Rosedale.

*H. calycinum* L. Alien. Subspontaneous or planted in Cleveland in Mulgrave woods, *Mudd!* Indigenous in Turkey.

2 *Acer campestre* L. Native. Area general. Range 0-300. Frequent in woods and hedges, and occasionally, but not commonly, in the aboriginal woods of the calcareous hills. The highest place in which I have seen it is amongst the rocks at the foot of Whitstoncliff.

*A. Pseudo-platanus* L. Denizen. Area general. Range 0-450. The Coniferæ excepted, the Sycamore is the commonest of the trees which is not clearly indigenous. If introduced its introduction must date back to a very ancient period. I have not heard that it has been met with in the post-glacial peat deposits,\* but at the present day it is common both

\* For an account of the old peat deposits of Holderness and Thorne waste and the trees which

in the low country and amongst the hills. In both our eastern and western dales no tree is more frequent about villages and farmhouses. I have never seen it in any quantity in a clearly aboriginal wood, like the Ash, Oak, Birch, Hazel, Holly, Wych Elm, &c., or even like *Tilia parvifolia* in Slip gill, but have often noticed a single tree or two or three trees in very wild-looking places, as for instance, East Stonesdale woods, and in Cliff gill, where there were no houses within a considerable distance, and no other seemingly introduced trees or other plants near. Upon the whole I would say, that with us the Sycamore, like the Gooseberry bush and Cherry tree, is not unlikely to be indigenous, but that I have not seen or heard of any evidence which shows conclusively that such is the case.

1 *Erodium cicutarium* Smith. Native. Area 8 7 6 5 4 3 2 1. Range 0-150. Frequent in sandy ground in the low country, both along the sea-coast and inland, ascending to Yearsley moor.

6 *E. moschatum* Smith. Denizen? Area 3. Range 50. Waste ground at the roadside at Falsgrave near Scarbro', *Ibbotson*. I have not seen a specimen, and Mr. Bean does not know the station. A Native of the South of England.

*Geranium phæum* L. Alien. Subspontaneous in several places in the neighbourhood of parks and gardens. Aske, Kirklington, Swinton, Newton in Cleveland, Upsal, Feliskirk, Kilvington, Newburgh, Castle Howard, &c. Indigenous in France and Holland.

*G. nodosum* L. Alien. Subspontaneous or planted in Aske woods, *Ward*: and in a wood near Kirklington, *Hebblethwaite*! Indigenous in France and Austria. The Italian *G. striatum* is also subspontaneous in Aske woods.

3 *G. sylvaticum* L. Native. Montane. Area 9 8 7 5 4 3. Range 100-550. Common in the woods and meadows of the western dales; ascending to Cronkley and White force scars, Raven's seat and Cover head falls, descending to Rokeby, Richmond and Wensley. Amongst the eastern hills in several places; Guisbro', Kilton, Castleton, Mulgrave woods, Helmsley, &c. Not known at all as a plant of the vales.

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they contain, reference may be made to Phillips' Yorkshire. They are evidently all of post-glacial date. Some of the Holderness deposits are below the present sea-level, but others must be referred to the Historic era. Respecting one of the deposits at Hatfield, Mr. De La Pryme writes in the Philosophical Transactions for 1701,—“Many of the trees have been burnt, sometimes quite through: others chopped, squared, bored through or split, • • and this at depths and under circumstances which preclude all supposition of their having been touched since the destruction of the forest.” The trees named by Phillips as found in them are Oak, Yew, Alder, Ash, Willow, Scotch Fir, Thorn, Hazel, Beech and Birch.

1 *Geranium pratense* L. Native. Area general. Range 0-400. Frequent infields and by the side of streams, ascending in Teesdale to the falls of Blea beck.

2 *G. pyrenaicum* L. Native. Area 9 8 6 5 4 3 2. Range 0-100. Roadsides and hedgebanks in several places in the low country. West Layton, Aske, Newton and Ayton in Cleveland, Thirsk, Acomb, Helmsley, Concysthorp, Ganthorp, &c. I have no hesitation in considering the species as Native. I have not seen it within our limits as a garden plant, and it grows upon hedgebanks like pusillum, molle and columbinum.

2 *G. pusillum* L. Native. Area 9 8 7 6 5 4 3 2. Range 0-250. Frequent upon hedgebanks and along roadsides, ascending to Leyburn Shawl and Applegarth scars.

1 *G. molle* L. Native. Area general. Range 0-500. Common in similar situations to the preceding, and often growing in cultivated fields. It ascends to Keld and Tanhill.

1 *G. dissectum* L. Native. Area general. Range 0-300. Common in similar situations to the preceding throughout the Lower zone.

2 *G. columbinum* L. Native. Area 8 7 6 3 2 1. Range 0-250. Frequent upon grassy banks in the low country, ascending to Aysgarth force and Applegarth scars.

1 *G. lucidum* L. Native. Area 9 8 7 3 2. Range 100-500. Frequent amongst rocks and stones in the western dales, ascending to White force scars. Not known to me as a plant of the Central Valley, and on the east I am acquainted with it only in a few stations amongst the calcareous hills; Boltby Scar, Whitstoncliff, Rainton heights, &c.

1 *G. robertianum* L. Native. Area general. Range 0-650. Common in shaded places, ascending to the Main Limestone scars of Booze moor and Widdale fell.

1 *G. sanguineum* L. Native. Xerophilous. Area 5 3 2. Range 0-250. Amongst the eastern calcareous hills and in the Howardian tract in several places; Sutton Bank, Hawnby Bank, Yowlasdale, Flazendale, Hildensley, &c. Amongst the coast sandhills between Redcar and Marske.

*Impatiens Noli-me-tangere* L. Alien. An occasional straggler from garden cultivation. Waste ground near Great Ayton, *Mudd!*

1 *Oxalis Acetosella* L. Native. Area general. Range 0-800. Common in shaded places, ascending to the Main Limestone of Campfell, Widdale fell and Micklefell.

*O. corniculata* L. Alien. An occasional weed in gardens, as at Holdgate near York.

**SUMMARY.** Incognits and segregates excluded, 208 species come under this chapter, 42 of which are Aliens, 10 Denizens, 22 Colonists and 134 Natives. Of those of the three latter grades of citizenship 153 are plants of the Lower, 62 of the Middle, and 25 of the Upper zone: and they range under the types of distribution as follows, viz.; British 86, English 53, Scottish 7, Highland 2, Germanic 7, Atlantic 3, Intermediate 8.



## CHAPTER XVI.

### CALYCIFLORÆ.

2 *Euonymus europæus* L. Native. Area 9 8 7 6 5 4 3. Range 0-250. In several of the aboriginal woods of the dales, and where it does occur, unlike many of the other shrubs, usually a true native. On the west in Balderdale, at Red scar, Whitcliffe wood, Clink Bank, Gilling woods, Aysgarth force, Leyburn Shawl. In the low country in hedges between York and Tadcaster and by the Leven between Crathorn and Hutton Rudby. On the east at Newton wood, Saltburn, Arncliffe woods and New Holme beck near Whitby, Beckdale, Wath wood, Kitscrew wood, &c.

*Staphylea pinnata* L. Alien. Subspontaneous or planted in hedges at Newton in Cleveland, *Mudd!* A native of Germany and the west of France.

2 *Rhamnus catharticus* L. Native. Area 8 7 6 5 3 2. Range 0-250. Not unfrequent in woods and hedgerows in the low country, ascending to the aboriginal woods of Yowlasdale, and in Wensleydale to Aysgarth force.

2 *R. Frangula* L. Native. Area 8 6 3. Range 0-100. Indigenous in some of the carrs of the Central Vale and Howardian tract. Askham bogs, Leckby Carr, Cawklees wood, Airyholme wood, Cum hag wood, Hildenley wood, &c.

1 *Spartium scoparium* L. Native. Area general. Range 0-300. Common in sandy and heathery tracts throughout the lower zone, but comparatively rare in the calcareous dales. Cultivated up to 350 yards. In Scotland it ascends into the Arctic Region.

1 *Ulex europæus* L. Native. Area general. Range 0-400. Common upon heaths and uncultivated pieces of ground both in the low country and amongst the hills. Like the preceding it is comparatively rare in the

calcareous dales of the west. In Teesdale its usual place is filled by Juniper and *Potentilla fruticosa*: in Swaledale by Yew bushes.

2 *Ulex Gallii* Planch. Native. Area 9 8 7 5. Range 0-200. In similar situations to the preceding, but rare. In the west on Barningham moor, *Simpson*!, Gatherley moor, *Ward*, and Nomans moor near Newton-le-Willows, *Mudd*. In Cleveland on Black moor, between Stokesley and Nunthorpe.

2 *Gemista tinctoria* L. Native. Area general. Range 0-200. Frequent in grassy places in the low country, ascending in Teesdale to Cotherstone.

1 *G. anglica* L. Native. Area 8 6 5 4 3 2 1. Range 0-300. Frequent upon heaths throughout the Lower zone.

1 *Ononis arvensis* L. Native. Area general. Range 0-250. Frequent in grassy places in the low country, ascending to Mickleton and Preston-under-Scar.\*

1 *O. antiquorum* Angl. Native. Area 9 8 5 4 3 2<sup>1</sup>. Range 0-150. In similar situations to the preceding, but less frequent.

1 *Anthyllis Vulneraria* L. Native. Subxerophilous. Area general. Range 0-600. Dry banks, one of the most frequent of the species which have upon their distribution the Xerophilous stamp. On the west it is frequent about the Magnesian Limestone and in the calcareous dales, and ascends to the Sugar Limestone of the Cronkley plateau. Amongst the sandhills and along the cliffs of the coast line it is frequent from Middlesbro' to Scarbro'. It is common in the eastern calcareous tract, and occurs in dry sandy ground in several places in the Central Vale and elsewhere; Crakehall, Romanby, Kirklington, Thirsk, Hutton Conyers, Aisenby, Acomb and Clifton Ings near York, &c.

*Medicago sativa* L. Alien. Frequently spontaneous in cultivated fields. The report of *M. falcata* from Hovingham (*Flora*) is erroneous.

1 *M. lupulina* L. Native. Area general. Range 0-300. Common upon dry banks and in cultivated fields throughout the Lower zone, ascending to the Hambleton plateau and the flagstone quarries of Leyburn moor.

2 *M. maculata* Sibth. Native. Area 5 4 3. Range 0-100. Sandy ground, rare. In Cleveland upon the basaltic ridge at Langbargh, and plentiful at Marske in sandy ground at the end of the village nearest the sea. Abundant also upon the Castle hill at Scarbro', and on the south side of the Esk below Larpool woods.

2 *M. denticulata* Willd. Native. Area 3. Range C.L. With the

preceding upon the slope of the Castle hill at Scarbro'. This is the most northern indigenous station for the plant which is known in Britain. It has also been gathered by Mr. W. Foggitt upon a rubbish heap by the side of the footpath between Thirsk and Sandhutton.

2 *Melilotus officinalis* Willd. Colonist. Area general. Range 0-200. Frequent in cultivated fields in the low country, ascending in Wenaleydale to Wensley and Carperby.

*M. arvensis* Willd. Alien. This species I have only once seen within our limits, and that was in 1861, upon the edge of a cultivated field east of South Kilvington near Thirsk, where it grew in tolerable plenty.

*M. vulgaris* Willd. Alien. Casually subspontaneous in cultivated fields and waste ground. Richmond, Kilvington, Thirsk, York, &c.

1 *Trifolium repens* L. Native. Area general. Range 0-800. Everywhere common in grassy places, ascending to the Main Limestone of Camfell and Mickelfell.

*T. elegans* Savi! Alien. This species, a native of the south of Europe, I have met with in a subspontaneous state upon the embankment of the railway near Thirsk. *T. hybridum* L. which I cannot distinguish specifically, is occasionally cultivated in fields under the name of Allsike Clover. *T. incarnatum* L. is also sometimes cultivated and is occasionally to be met with as a weed in cultivated fields.

1 *T. pratense* L. Native. Area general. Range 0-550. Commonly cultivated and common as a wild plant in grassy places, ascending in Swaledale to Crook Seat, Hollow mill cross and the limestone plateau of Keasdon.

1 *T. medium* L. Native. Area general. Range 0-450. Frequent in grassy places and the borders of woods and fields, ascending to Maze beck, Raven's Seat and the falls of the Cover at the foot of Great Whernside.

1 *T. arvense* L. Native. Area 8 7 6 5 3 2. Range. 0-100. Not unfrequent in sandy ground in the low country. Brompton-on-Swale, Hutton Conyers, Pickhill, Acomb, Middlesbro', Thirsk, Tollerton, Ter-  
rington, Malton, &c.

2 *T. scabrum* L. Native. Area 8 7 6 5 3. Range 0-150. Rare in dry ground. In a limekiln at Coalsgarth and on Ellershaw hill near Wensley, Ward. Near Acomb in the lane towards Askham and in sandy ground near the Ouse, Backhouse. In Cleveland near Nunthorpe, Mudd! At Scarbro' on walls near the Castle, Peirson!

2 *T. striatum* L. Native. Area 8 7 5 3 1. Range 0-300. Rare in sandy ground, but ranging throughout the Lower zone. It ascends to the

flagstone quarries of Leyburn moor, and grows upon the slope of the Richmond Castle hill. In the Central Valley it occurs at Bury hills near Kirklington, by the roadside between Aisenby and Leekby, in Cleveland on the basaltic ridge at Langbargh, in the Howardian tract in sandpits at Ganthorpe and at Scarbro' upon the Castle hill.

2 *Trifolium fragiferum* L. Native. Area 6 5. Range 0-100. Amongst the coast sandhills plentiful at Middlesbro' and Coatham, and inland in damp sandy ground at Knavesmire near York.

1 *T. procumbens* L. Native. Area general. Range 0-300. Frequent in dry ground throughout the Lower zone, ascending to the flagstone quarries of Leyburn moor.

2 *T. minus* Roth. Native. Area general. Range 0-300. Frequent in grassy places throughout the Lower zone, ascending on the east to Silhow cross near Sleights, and on the west as high both in Gretadale and Arkendale. The true *T. filiforme* is a plant of the East Riding, but I do not know that it has been seen within our limits.

1 *Lotus corniculatus* L. Native. Area general. Range 0-800. Common in grassy places, ascending to the Main Limestone of Micklefell. *L. tenuis* is frequent in dry ground in the low country.

1 *L. major* Scop. Native. Area general. Range 0-400. Frequent in damp and shaded places, ascending in Coverdale to the foot of Great Whernside.

5 *Astragalus glycyphyllos* L. Native. Xerophilous. Area 9 7 6 3. Range 0-150. In the west upon the Main Limestone near the Tees at Eglestone Abbey, and in the Yore district between East Witton and the bridge over the Cover. About the Magnesian Limestone near the Yore at Tanfield and the Wharfe at Thorp Arch. Upon the Middle Oolite in the Howardian tract at Cawklees wood, and near Scarbro' at Barrowcliff and the White Nab.

5 *A. Hypoglottis* L. Native. Xerophilous. Area 6 5 4 3. Range 0-150. Like the preceding this species furnishes a well-marked illustration of the Xerophilous role of distribution. About the Magnesian Limestone near the Wharfe at Thorp Arch. Upon the Middle Oolite in the Howardian tract and along the calcareous range by way of Pickering and Ebberton to Hackness. Amongst the coast sandhills at Middlesbro', Coatham and Marske.

1 *Ornithopus perpusillus* L. Native. Area 8 7 6 3 1. Range 0-150. Not unfrequent in the sandier parts of the Central Vale and Howardian tract. Leeming Lane, Hutton moor, Acomb, and many places amongst

the sandy commons about Stockton, Strensall, Dunnington and Terrington.

2 *Hippocrepis comosa* L. Native. Xerophilous. Area 97. Range 200-600. In Teesdale with *Helianthemum canum* upon the sugar limestone of Cronkley fell. In Wensleydale by the Yore side at Aysgarth force.

2 *Onobrychis sativa* Lam. Native? Xerophilous. Area 73. Range 0-100. About the Magnesian Limestone at Tanfield, Simpson: and Nosterfield, *Hebblethwaite*. Upon the Middle Oolite at Ayton near Hackness, Bean. Reported also from the neighbourhood of Thorp Arch, and occasionally cultivated.

1 *Vicia sylvatica* L. Native. Area 987432. Range 0-250. Not unfrequent amongst the woods of the more undulated tracts. In Teesdale about the lower part of Deepdale and of the Greta, and about Rokeby and Eglestone Abbey. In Swaledale below the Red Scar and along Billy bank to Richmond. In the Yore district on the slope of Leyburn Shawl, and in the woods at West Witton and Burton Constable. In the Central Valley on Hutton moor, and in the Vale of Mowbray in Cotcliffe wood. In Cleveland at Saltburn, Mulgrave woods, Rathwaite woods, and above the Robin Hood's bay alum works. In the Howardian tract in several places and amongst the eastern calcareous hills about Hackness and Scarbro'.

1 *V. Cracca* L. Native. Area general. Range 0-400. Frequent in hedges and grassy places, ascending to Upper Cronkley and Raven's seat.

*V. varia* Host. Alien. Casually subspontaneous in tolerable plenty in a field between Thirsk and Kirby Knowle, 1861, where it was first noted by Mr. W. Foggitt.

1 *V. sativa* L. Native. Area general. Range 0-350. The true *V. sativa* is cultivated for forage from the vales upwards as high as field cultivation reaches, and is frequently subspontaneous in cultivated ground. *V. segetalis* Thuill. is a common cornfield weed. *V. angustifolia* Roth is frequent in fields and grassy places throughout the Lower zone.

1 *V. lathyroides* L. Native. Area 6. Range 50. In the Ainsty in sandy ground at Acomb and in the lane towards Askham. Reported also from Hutton Moor near Stokesley.

1 *V. sepium* L. Native. Area general. Range 0-500. Common in shaded and grassy places, ascending to Cronkley scars and the Main Limestone cliffs of West Stonesdale moor and Punchard's gill.

2 *V. bithynica* L. Native. Area 4. Range C.L. This species has long been known in one locality, the diluvial sea-bank on the north of the village of Upgang, where it still grows. The bank is mainly composed of

clay, and its summit is fully 100 feet above the seashore, and the *Vicia* grows principally in a sandy hollow adjacent to *Hippocrepis emerus*.

1 *Vicia hirsuta* Koch. Colonist. Area general. Range 0-200. Frequent in cultivated fields in the low country.

2 *V. tetrasperma* Koch. Colonist. Area 9 8 5 4 3 2 1. Range 0-100. In similar situations to the preceding but less frequent. Dalton-on-Tees, Richmond, Kirklington, Middlesbro', Coatham, Eston, Northallerton, Thirsk, York, Castle Howard, &c.

*Faba vulgaris*, *Pisum arvense* and *P. sativum* are all three frequently grown both in fields and gardens, the two former up to 350 yards, the latter up to 300 yards.

*Lathyrus Aphaca* L. Incognit. Reported by Teesdale from fields at Malton.

1 *L. pratensis* L. Native. Area general. Range 0-400. Frequent in grassy places, ascending to Upper Cronkley, Sleightholme, the falls above Cotterdale village, and the Main Limestone scars of West Stonesdale moor.

2 *L. sylvestris* L. Native. Area 4 3. Range 0-100. By the Esk side near Ruswarp, *Mudd!* and near Scarbro' at Barrowcliff.

*L. latifolius* L. Alien. An occasional straggler from garden cultivation. A native of France and Germany.

1 *Orobis tuberosus* L. Native. Area general. Range 0-500. Common in grassy and heathery places, ascending to Whitstondale and Cronkley scars.

1 *Prunus spinosa* L. Native. Area general. Range 0-450. The true *P. spinosa* is common in woods and hedges throughout the Lower zone. In the aboriginal woods of the dales it is much less frequent than the Hazel and Whitethorn, and only seldom, as below Whitstoncliff, forms woods or thickets of any considerable size by itself. It ascends in Swaledale to the Main Limestone scars of West Stonesdale moor and in Yoredale to those of Preston Scar and Harlen fell. *P. insititia* is less frequent; and *P. domestica* is occasionally to be met with in hedgerows and planted woods, and is grown in gardens up to 250 yards.

3 *P. Padus* L. Native. Area 9 8 7 5 4 3 2. Range 0-550. Frequent in woods and hedgerows amongst the hills, and occasionally in the open low country. It ascends to Cronkley scars, and the Main Limestone scars of Punchard's gill.

2 *P. avium* L. Denizen. Area 9 8 7 5 4 3 2. Range 0-250. Frequent in woods and hedgerows in the Lower zone. Perhaps a native of

some of the dale woods, as for instance those of Sleightholme dale and Arncliffe in Eskdale, but I have not seen any completely satisfactory indigenous station. It is cultivated up to 350 yards.

1 *Spiraea Ulmaria* L. Native. Area general. Range 0-600. Common in damp and shaded places, ascending to the White force scars, the Main Limestone scars of Punchard's gill, and the limestone pavement of Camfell.

2 *S. Filipendula* L. Native. Xerophilous. Area 8 7 6 5 4 3 2. Range 0-350. About the Magnesian Limestone at Catterick bridge, Tanfield, Thornbro' and Thorp Arch. In the Central Valley at Leeming, and by the railway side south of Cowton station. In Cleveland on the basaltic dike at Langbargh, and amongst the coast sandhills between Marske and Saltburn. In the Howardian tract in several places, and along the calcareous range from Boltby scar and Yowlasdale eastward to Scarbro' cliffs.

*S. salicifolia* L. Alien. Subspontaneous or planted in Aske woods near Richmond, and Ormesby woods near Middlesbro'. A native of Austria and Russia. The American *S. opulifolia* occurs, or has occurred, under similar circumstances in a wood at Easby near Richmond, *Ward!*

4 *Dryas octopetala* L. Native. Montane. Subxerophilous. Area 9. Range 600. With *Helianthemum canum* upon the sugar limestone of Cronkley fell.

1 *Geum urbanum* L. Native. Area general. Range 0-350. Frequent in woods and upon hedgebanks throughout the Lower zone, ascending to the foot of Widdale and the Swale side west of Keld.

1 *G. rivale* L. Native. Area general. Range 0-800. Frequent in damp and shaded places, ascending to the Main Limestone of Micklefell. *G. intermedium* Ehrh., which is frequent in woods, appears to be a hybrid between this and the preceding.

1 *Agrimonia Eupatoria* L. Native. Area general. Range 0-400. Frequent in grassy places, ascending in Swaledale to the Main Limestone scars of West Stonesdale moor.

7 *Potentilla fruticosa* L. Native. Montane. Area 9. Range 250-400. This species in Upper Teesdale is one of the most prominent plants of the riverside. It begins at Upper Cronkley, is plentiful about the High force and Winch bridge, and continues down the river as far as the Middleton bridge. It is given by Ray as a plant of the Tees side near Eglestone Abbey, but I have not seen it there, and probably it was only casually washed down. Its abundance in Teesdale, considered in connection with its rarity in the rest of Britain, is one of the most salient facts of plant-topography which it falls within the scope of these notes to register.

1 *Potentilla anserina* L. Native. Area general. Range 0-350. Frequent along roadsides and in waste ground, ascending to Marske moor and the plateau of the Hambleton hills above Boltby.

7 *P. verna* L. Native. Xerophilous. Area 7 3. Range 100-250. Reported by Curtis and Fothergill from Seamerdale, and by Teesdale from the neighbourhood of Hovingham, but not seen recently.

4 *P. alpestris* Hall. Native. Montane. Area 9 7. Range 300-500. In Teesdale on Cronkley scars and by the stream at the falls of Maze beck and Winch bridge. In the Yore district on the Main Limestone scars of Harlen fell over Waldendale.

2 *P. reptans* L. Native. Area general. Range 0-350. Frequent in waste and grassy places, ascending to the plateau of the Hambleton range over Boltby.

1 *P. Tormentilla* Schk. Native. Area general. Range 0-850. Common in grassy and heathery places, ascending to the peaks of almost all the higher hills, Mickelfell, Great Whernside, Lovely Seat, &c. *P. nemoralis* is frequent in the low country.

1 *P. Fragariastrum* Ehrh. Native. Area general. Range 0-400. Common upon hedgebanks throughout the Lower zone, ascending to the plateau of Hambleton End.

1 *Comarum palustre* L. Native. Area general. Range 0-500. Frequent in peat bogs amongst the hills, ascending to the tarn on the Lunedale side of Mickelfell. Occasionally in the open low country, as at Pickhill, Carthorpe, Askham bogs, Carlton Carr, Leekby Carr, &c.

1 *Fragaria vesca* L. Native. Area general. Range 0-500. Common in shaded and grassy places, ascending to Cronkley Scars and the Main Limestone scars of Punchard's gill.

*F. elatior* Ehrh. Alien. Cultivated and occasionally subsontaneous. Richmond, Sinderby, Hob moor near York, &c.

4 *Rubus Chamemorus* L. Native. Montane. Area 9 8 7. Range 400-850. Confined to the western hills. It is frequent upon most of the higher summits; Mickelfell, Great Whernside, Dodfell, Rogan's Seat, Nine Standards, &c., and descends to Barningham moor and the Tees side at Upper Cronkley. This species, *Empetrum nigrum* and *Lycopodium Selago* are the only three of the Montane plants which enter into prominent association with the swamp-heatherland flora of the high gritstone swells.

3 *R. saxatilis* L. Native. Montane. Subxerophilous. Area 9 8 7 3. Range 100-550. In Teesdale upon the scars of Cronkley fell and Cross-



thwaite beck, and about the stream at the Maze beck falls, Winch bridge, Middleton and Eglestone Abbey. In Swaledale on Whitstondale scars, in Cliff gill, Gunnerside gill, at Keasdon force and in several places lower down about Downholme and Richmond. In the Yore district at Fossdale woods, Widdale, Gale force, Whitfell force, Aysgarth force, &c. In the dales of the eastern calcareous range frequent from the Hambleton hills eastward to Forge valley, and occurring also in several places in the Howardian tract.

1 *Rubus Idæus* L. Native. Area general. Range 0-550. Frequent in woods and thickets, especially amongst the hills, ascending to Cronkley Scars and in Punchard's gill above the Main Limestone cliffs and waterfall.

2 *R. plicatus* Weihe.\* Native. Area 6 5 3 2 1. Range 0-150. In the Central Valley in Askham bogs, hedges near Alne and plentiful in Carlton Carr. In the Vale of Mowbray in Cotcliffe wood. In the Howardian tract in Potichar bank wood near Hovingham. Amongst the eastern hills in several places: Kildale, Gribdale, Bilsdale, Snailesworth, Newton dale, &c. The true *R. suberectus* we do not appear to have.

2 *R. nitidus* Salter. *R. Lindleianus* Lees! Native. Area general. Range 0-300. Frequent in woods and hedges throughout the Lower zone. *R. affinis* of Suppl. Flo. Yorks. must be referred here. A peculiar small-leaved form grows at Gormire, and in heathery ground in several other places amongst the eastern hills.

2 *R. rhamnifolius* Weihe. Native. Area 8 7 6 5 4 3 2 1. Range 0-200. Frequent in thickets in the low country, especially about the borders of heaths or in peaty soil.

2 *R. thyrsoides* Wimm. Native. Area 5 3 2. Range 0-150. In Cleveland in hedges between Redcar and Kirkleatham, *Mudd!* It grows also at Laskill in Bilsdale, and Bloxam's *macroanthus!* in hedges at Sow-erby near Thirsk.

2 *R. discolor* Weihe. Native. Area general. Range 0-300. Hedges and thickets throughout the Lower zone, the commonest species of the fruticose series.

2 *R. leucostachys* Smith. Native. Area 9 8 7 6 5 4 3 2. Range 0-200. Frequent in woods and thickets in the low country.

\* In the determination of our fruticose Brambles I have relied mainly upon the fascioli of Bloxam and Leighton. During a recent visit to Thirsk, Professor Babington kindly looked over my collection of North Yorkshire specimens, and gave me his opinion upon the doubtful plants. It will be seen that nine of the species are noted in all or nearly all the districts. With us the presence of fruticose Rubi is a characteristic of the Lower zone, as well marked and as widely exhibited as the presence of *Pteris* is for the Agrarian region as a whole.

2 *Rubus carpinifolius* Weihe. Native. Area general. Range 0-300. Frequent in hedges and thickets throughout the Lower zone. I have included here along with the veritable *carpinifolius* both *umbrosus* and *amplificatus*, both of which are frequent.

8 *R. mucronulatus* Boreau. *R. mucronatus* Blozam! Native. Area 5 4 3 2. Range 0-300. In the Central Valley in hedges at Sowerby and Thorp field. In the Howardian tract in Gilling woods. Amongst the eastern moorlands in several stations; Newton wood, Kildale, Lounsedale, Langbargh wood, Wainstones wood, Easterside, Hawaby, Boltby bank, &c.

2 *R. calvatus* Blozam! Native. Area 3 2. Range 100-150. In the Vale of Mowbray in the wood above Kirby Knowle. In Newtondale in thickets near Levisham station.

2 *R. Sprengelii* Weihe. Native. Area 8 5 3 2. Range 0-150. In Swaledale at the Sandbeck and in a wood near Hipswell lodge, *Ward!* In the Central Valley at Sowerby and Woodend. In the Howardian tract in Gilling woods. In Cleveland in Lounsedale and Airyholme wood, *Mudd!*

8 *R. Blozami* Lees! Native. Area 3 2. Range 100-150. I have seen this in two places only, thickets in Stonecliff wood near Mount St. John, and near Laskill bridge in Bilsdale.

2 *R. Radula* Weihe. Native. Area general. Range 0-300. Frequent in woods and hedgerows throughout the Lower zone. It is not unlikely that I may have included *R. rudis* and *R. Hystrix* here, but I do not know either of them clearly as plants of North Yorkshire, and the genuine *Radula* is one of our commonest Brambles.

2 *R. rosaceus* Weihe. Native. Area 6 3 2. Range 0-150. In the Central Vale in hedges near Askham Richard, and plentiful in a wood between Sowerby and Dalton. In Bilsdale in hedges near Laskill bridge.

2 *R. Lejeunii* Weihe. Native. Area 5. Range 100-150. In Kildale in a wood near the low fishpond, *Mudd!*

2 *R. Koehleri* Weihe, including *pallidus* Weihe. Native. Area general. Range 0-300. The common Bramble of woods both in the low country and amongst the hills, and occurring sometimes also in hedges. It ascends nearly to the head of Flazendale and in Wensleydale to Apperset bridge.

2 *R. diversifolius* Lindl. *Bab!* *R. fuscoater* Suppl. *Flo. Yorks.* Native. Area general. Range 0-250. Frequent in woods and hedgerows, ascending in Swaledale to a wood near the Marrick smelting-mill.

2 *R. Guntheri* Weihe. Native. Area 9 5 4 3 2. Range 0-200. Not uncommon in thickets amongst the hills. On the west in Deepdale woods. Amongst the eastern moorlands in several places; Kildale, Danbydale,

Crunkley gill, Guisbro' Spa woods, Knayton moor, Gormire, Flazendale, Wass bank, Hood hill, &c. In Cleveland in hedges between Marton and Nunthorpe.

8 *Rubus humifusus* Weihe. Native. Area 2. Range 200. With the preceding upon the hill-slope between Whitstoneliff and Gormire.

2 *R. glandulosus* Smith. Native. Area 8 3. Range 100-200. This includes *R. Bellardi* and *R. hirtus*, the latter the *fuscus* of Babington! and Lees! The former grows in Terrington Carr; the latter in thickets near Hudswell, in Bilsdale in several places from Chop Yate down the dale as far as Hawnby, and in the Howardian tract in Hovingham and Gilling woods.

2 *R. corylifolius* Smith. Native. Area general. Range 0-200. Next to discolor, the commonest Bramble of the low country hedges, but rare either in woods or amongst the hills. *R. Balfourianus* grows in the East Riding in hedges between Heslington and Langwith, but I have not seen it within our limits.

8 *R. altheifolius* Host. Bab! Native. Area 8 2. Range 0-100. In the Central Valley in a few places in hedges near Thirsk and Topcliffe, and I have gathered what I believe to be the same in Whitcliffe wood near Richmond.

2 *R. tuberculatus* Bab! *R. nemorosus* Angl. non Hayno. Native. Area general. Range 0-200. Frequent in the lowland hedgerows and sometimes also in woods.

2 *R. casius* L. Native. Area general. Range 0-300. Frequent in woods and hedges throughout the Lower zone.

1 *Rosa spinosissima* L. Native Subxerophilous. Area 9 8 7 6 5 4 3 2. Range 0-500. In numerous stations amongst both the eastern and western calcareous hills, ascending to Cronkley and Whitstondale scars. About the Magnesian Limestone at Catterick bridge, Nosterfield, Tanfield and Thorp Arch. In the Central Valley at Croft, Middleton Tyas, Burrell, Brompton-on-Swale, Wath, Nunwick, Thirsk, &c. In Cleveland at Saltburn, Kirkleatham, Wilton, Guisbro', Stokesley, Arncliffe wood in Eskdale, Ruswarp, &c., and on the basaltic ridge at Langbargh. In the Howardian tract in several localities.

7 *R. hibernica* Smith. Native. Area 5. Range 100-200. In Cleveland sparingly in Airyholme wood, and more abundant in hedges at Newton, where it was discovered by Mr. Mudd in 1853, and where I gathered it, under his guidance, in 1861.

2 *R. Sabini* Woods. Native. Area 9 8 6 5 4 3 2. Range 0-300. Not

unfrequent in hedges and thickets throughout the Lower zone. In Teesdale at Winch bridge and Lonton, and in Swaledale at Coalsgarth. About the Magnesian Limestone at Oglethorpe Ings, Thorp Arch. In the Central Valley by the Tees side between Croft and Stapleton, and hedges between Thirsk and Woodend, and thickets upon the Hill-top farm near Thornton-le-street. In Cleveland in Cliff-rig wood, and hedges at Saltburn and Upleatham. Amongst the eastern calcareous hills, in Yowlasdale and Hildenley wood. This includes both *gracilis* and *Doniana*. The Teesdale plant has been referred to *involuta*, which probably is not specifically distinct.

1 *Rosa villosa* Angl. Native. Area general. Range 0-500. Frequent in hedges and thickets, finest in the dales, ascending to Cronkley and Holwick scars. Our plant is *R. mollissima* of Willdenow and Fries, but whether *R. pomifera* Herm. be really distinct may be doubted.

1 *R. tomentosa* Smith. Native. Area general. Range 0-500. Common in hedges and thickets, ascending in Teesdale to the White force scars, and in Arkendale to the Main Limestone scars of Punchard's gill. A wide range of forms is comprised here, including *R. intricata* Crepin!, *R. cuspidata* Boreau, and a plant with ciliated petals which in other respects corresponds with normal *tomentosa*.

2 *R. micrantha* Smith. Native. Area 8 6 4. Range 0-250. In Upper Swaledale in several places about Satron and Gunnerside. Hedges on the north side of the Wharfe at Thorp Arch, *Hailstone*! In Cleveland in Mulgrave woods and hedges at Sandsend. *R. inodora* as a plant of North Yorkshire is quite doubtful.

2 *R. rubiginosa* L. Native. Area 9 8 5 3 2. Range 0-150. Rare in woods and perhaps introduced in some of its stations. In Swaledale in Marske woods. Hedges at Forcett and near the Tees west of Gainford. In the Central Valley at Sandhutton and between Yarm and High Worsall. Hedges between Pickering and Kirby-moorside. Cultivated in gardens up to 350 yards.

1 *R. canina* L. Native. Area general. Range 0-450. Much the commonest Rose of the hedges and thickets of the low country, ascending in Arkendale to Copperthwaite scars. We have in North Yorkshire a wide range of segregates, amongst which are *lutetiana*, *urbica* and *tomentella* Leman, *Malmundariensis* Lejeune, *biserrata* Merat, *dumalis* Bechstein and *dumetorum* Thuillier. A plant which grows at Sowerby near Thirsk, with fruit ripening as in *tomentosa* and subsistent erecto-patent glandular sepals is referred by Professor Crepin to *R. tomentella*.

2 *Rosa arvensis* L. Native. Area general. Range 0-150. Frequent in thickets and hedgerows, the most plentiful in the lower part of some of the calcareous dales, as for instance, Ryedale about Rievaulx and Helmsley. *R. systyla* is reported by Spruce from hedges in the vale of Pickering near Kirby Misperton.

7 *Sanguisorba officinalis* L. Native. Area general. Range 0-500. Common in grassy places, ascending in Teesdale to the falls of Maze beck.

2 *Poterium Sanguisorba* L. Native. Subxerophilous. Area general. Range 0-550. One of the most widely distributed of the species which have the Xerophilous restriction. It is frequent in the limestone country both on the west and east of the Central Valley, and ascends to the Main Limestone of Gilmansear, Copperthwaite moor and Askrigg moor. In the Central Valley it grows by the Tees side between Croft and Dalton, by the Swale at Mawnby, and by the Ouse along Clifton Ings near York; upon the Lias at Knayton; upon the basaltic dike at Langbargh; and amongst the coast sandhills at Redcar, Marske, Sandsend and Whitby.

1 *Alchemilla vulgaris* L. Native. Area general. Range 0-800. Frequent in grassy places, ascending to the Main Limestone of Micklefell.

1 *A. arvensis* L. Native. Area general. Range 0-450. A common weed of cultivated fields from the vales upward as high as field cultivation reaches, and sometimes growing also upon walls and dry banks. It ascends in Teesdale to the slope of Holwick fell.

1 *Cratægus Oxyacantha* L. Native. Area general. Range 0-500. The ordinary component of the vale hedgerows and common also in woods and thickets amongst the hills, ascending in Teesdale to Cronkley and Holwick scars, in Swaledale to Copperthwaite scars and the Main Limestone cliffs of Harlen fell. *C. monogyna* Jacq. is the commonest form, and *C. oxyacanthoides* Thuill. is also frequent.

2 *Pyrus communis* L. Denizen. Area 1. Range 0-100. Rare in hedges. It grows by the side of the road at Stockton near York, and in hedges by the side of the road between Thirsk and Easingwold, not far from where it crosses the Kyle. Our plant has strong spines, and glabrous mature leaves, and is *P. Pyrastor* Boreau. Cultivated in gardens up to 300 yards both against walls and as a standard.

2 *P. Malus* L. Native. Area general. Range 0-300. Common in woods and hedges in the low country, and occasionally in the aboriginal dale woods, as in Lunedale and Sleightholme dale. Cultivated in gardens up to 350 yards.

2 *P. Aria* Smith. Native. Montane. Xerophilous. Area 98.

Range 300-500. Indigenous in Teesdale upon Holwick scars and in Swaledale upon the Red Scars near Downholme. It grows in the bed of the Tees at Winch bridge, but I believe only upon the Durham side of the river, and in plantations is not uncommon.

1 *Pyrus Aucuparia Gaertn.* Native. Area general. Range 0-600. Not common in the low country, or in hedgerows and plantations, but one of the most frequent indigenous trees amongst the arenaceous hills, where it is often associated with the Birch. The highest stations in which I have seen it are upon the banks of a stream upon the plateau of Holwick fell, and on the spur of Cronkley fell west of the White force. No other tree ascends higher with us than this, and only the Juniper as high. For North Yorkshire we may say that the presence of trees, either aboriginal or planted, marks the Agrarian Region; the presence of fruticose Rubi, *Viburnum Opulus*, *Cornus sanguinea* and *Acer campestre* the Lower zone.

1 *Epilobium angustifolium L.* Native. Montane. Area 9 8 7 6 5 3 1. Range 0-550. In Teesdale upon the scars of Cronkley and Holwick, and by the streamside at Blea beck and the High force, and about the lower part of the Balder and the Greta. Plentiful in the West Swale district in Whitstondale, and occurring also in Punchard's gill and several places lower down the river as far as Richmond. In the Yore district at the head of Gammersgill and about the upper falls of Cotterdale. By the Wharfe near Thorp Arch, and in the Central Valley on Stockton Common and in Friarage woods near Yarm. Amongst the eastern hills in several places; Kildale, Bilsdale, Flazendale, Scarbro', and in the Howardian tract.

2 *E. hirsutum L.* Native. Area general. Range 0-200. Common in watery places in the low country, ascending in Wensleydale to Carperby.

1 *E. parviflorum Schreb.* Native. Area general. Range 0-300. Common in watery places throughout the Lower zone, ascending to Bowes, Marske moor, and Langthwaite in Arkendale.

1 *E. montanum L.* Native. Area general. Range 0-550. Common in damp and shaded places from the vales upwards to White force scars and the Main Limestone cliffs of Harlen fell and Punchard's gill.

2 *E. roseum Schreb.* Native. Area 9 8 7 6 2 1. Range 0-150. Watery places in the low country, rare. Richmond, Manfield, Masham, about Codbeck in several places, and about the Foss and in other places in the neighbourhood of York.

1 *E. palustre L.* Native. Area general. Range 0-650. Frequent in damp places, especially amongst the hills, ascending nearly to the summit of Dodfell. A plant which grows at Gormire (*E. ligulatum Baker*) is

intermediate in many of its characters between this species and *E. obscurum*.

1 *Epilobium tetragonum* L. with *E. obscurum* Schreb. Native. Area general. Range 0-350. Frequent in watery places, especially amongst the dales, ascending in Swaledale to Keld.

4 *E. alsinifolium* Vill. Native. Montane. Area 9 8. Range 500-750. In Teesdale upon the slope of Micklefell both towards the Tees, Maze beck, and the Lune; and in Swaledale near the leadmines in Gunnerside gill and Punchard's gill.

1 *Circæa lutetiana* L. Native. Area general. Range 0-400. Frequent in shaded places, ascending to the woods of Fossdale and Gunnerside gill.

*Oenothera biennis* L. Alien. Casually subspontaneous in waste ground in the neighbourhood of gardens. Indigenous in Temperate America.

1 *Hippuris vulgaris* L. Native. Area 8 7 6 5 4 3 2 1. Range 0-250. Frequent in ponds and slow streams in the low country. In the Wiske, Yore, Wharfe, Foss, Derwent, Costa, &c. Bedale, Snape, Pickhill, Guisbro', Slingsby, Malton, &c. In the Yore district in Seamer water.

2 *Myriophyllum verticillatum* L. Native. Area 8 7 5 4 3 2 1. Range 0-250. Not unfrequent in similar situations to the preceding. Langton, Pickhill, Yarm, South Stockton, Sleddale, Topcliffe, Crambeck, and in the Wiske and Derwent.

1 *M. spicatum* L. Native. Area 9 8 7 5 4 3 2 1. Range 0-400. Frequent in ponds and streams, ascending in Teesdale to Upper Cronkley.

1 *M. alterniflorum* D.C. Native. Area 6 3 2 1. Range 0-200. Peaty ponds and ditches, with us the rarest of the three species. Askham bogs, Carlton Carr, Stockton forest, Gormire, Newtondale, &c.

1 *Callitriche verna* L. including *C. platycarpa* Kutz. Native. Area general. Range 0-750. Common in ponds and slow streams, ascending to the little tarn on the end of the fell on the north of the source of the Swale, and the springs which issue from the Main Limestone of Micklefell.

1 *C. pedunculata* D.C. Native. Area 9 8 7 6 5 4 3 2. Range 0-350. In similar situations to the preceding throughout the Lower zone, but less frequent.

2 *Ceratophyllum demersum* L. Native. Area 1. Range 50. In the Foss near York, and with *Anacharis* in the Foss island ditches. *C. submersum* is reported by Archdeacon Peirson from ponds at Newburgh.

2 *Lythrum Salicaria* L. Native. Area general. Range 0-250. Frequent in watery places in the low country, ascending in the Yore district to Seamer water.

1 *Peplis Portula L.* Native. Area 9 8 4 3 2 1. Range 0-400. Ponds upon heaths, not unfrequent. In Teesdale at Upper Cronkley and in Swaledale on Downholme moor. About Pilmoor, Stockton forest and Strensall common. In the Howardian tract in several places. Amongst the eastern hills at Randaymere near Sleights and on Scawton moor.

2 *Bryonia dioica L.* Native. Area general. Range 0-100. Hedges in the low country, not by any means a common plant, but yet noted in all the nine districts.

1 *Montia fontana L.* Native. Area general. Range 0-750. Frequent in streams and damp places, especially amongst the hills. It ascends to the ridge between the peak of Nine Standards and the source of the Swale, and to the springs which issue from the Main Limestone of Micklefell.

1 *Scleranthus annuus L.* Native. Area 8 6 3 2 1. Range 0-100. Not unfrequent in sandy fields in the low country.

2 *Berberis vulgaris L.* Native. Area general. Range 0-200. Frequent in hedges and thickets in the low country, and occasionally amongst the hills.

*Epimedium alpinum L.* Alien. Subspontaneous or planted in Kildale woods, Mudd! A native of Austria and Italy.

7 *Ribes nigrum L.* Denizen. Area 9 8 7 5 4 3 2. Range 0-250. Commonly cultivated in gardens up to 350 yards, and frequently as if spontaneous in hedges and by the side of streams. I have not seen either this species or the following in a clearly indigenous condition.

7 *R. rubrum L.* Denizen. Area 9 8 7 6 5 4 3 2. Range 0-350. Commonly cultivated in gardens up to 350 yards, and, like the preceding, frequent in hedges and upon the banks of streams.

3 *R. petraeum Smith.* Native. Montane. Area 9 8 7. Range 100-500. About the Tees and its branches from Cronkley scars downwards by way of Lonton, Mickleton, Cotherstone, Deepdale and Rokeby to Pierse bridge. In Swaledale in several places; Stonesdale, Crackpot, Low Row, Reeth, Downholme, Hudswell and Easby. In the Yore district in Whitfell gill. Robson's *R. spicatum* grew formerly in an open wood at Applegarth near Richmond, but is now destroyed.

7 *R. alpinum L.* Native. Area 9 8 7 5 3 2 1. Range 0-250. Clearly indigenous in some of the woods of the lower part of our western dales, especially in Swaledale and the dale of Gilling. Woods and hedges in several places elsewhere; Pierse bridge, Thirsk, Knayton, Bagby, Ingleby Greenhow, Kildale, Thormanby, Coxwold, &c.; but probably planted in some of these stations.



7 *Ribes Grossularia* L. Denizen. Area general. Range 0-300. Commonly cultivated up to 350 yards, and commonly subspontaneous in woods and hedgerows throughout the Lower zone. The station most likely to be natural in which I have seen it is in Flazendale, where from a dozen to a score bushes form a thicket at the bottom of a calcareous glen, side by side with a similar thicket of Blackthorn. Upon the turf beneath them *Ophrys muscifera* grows, and some of the adjacent woods are clearly of aboriginal growth: but as there does not seem to be any of the *Ribes* elsewhere amongst them it is not unlikely it may have been planted, although there are no houses in the glen and no trace of an enclosure. I have noticed it in other stations by scores, but almost always single bushes, or two or three together, either by the streamsides or in hedgerows.

*Sedum Rhodiola* D.C. Incognit. Reported in the Flora from Mazebeck and Cronkley scars, but not seen there recently. It grows with *Saxifraga nivalis* in Highcup Nick, a few miles upon the Westmoreland side of Micklefell.

2 *S. Telephium* L. including *S. purpureum* Tausch. Native. Area 9 8 6 3 2 1. Range 0-500. Rocks and sandy ground from the vales upwards to the hill cliffs, rather rare. Cronkley scars, High force, Clink Bank, Carthorpe, Thirsk, Sandhutton, Yearsley moor, Stillington, Acomb, Copmanthorpe, Rosedale, Welburn, &c.

4 *S. villosum* L. Native. Montane. Area 9 7. Range 200-750. In Teesdale about the springs of Micklefell and eastward to Kelton fell, descending to the mouth of the Balder. In Gretadale at Sleightholme falls. In the Yore district on Widdale fell, Ten end, and Great Whernside, and in Seamerdale and Coverdale.

*S. dasyphyllum* L. Alien. Occasionally subspontaneous on walls and roofs. Bedale, Camphill, Tanfield, Coxwold, Terrington, Malton, Kirby-moorside. Indigenous in France.

*S. album* L. Alien. Like the preceding occasionally subspontaneous on walls and roofs. Greta bridge, Richmond, Bedale, Loftthouse, Lythe, Easington, Terrington, Middleton.

6 *S. anglicum* Huds. Native. Area 5 3. Range 0-100. In Cleveland at the round hill on Langbargh rigg, *Mudd.* On the Castle hill at Scarbro', *Bean.*

1 *S. acre* L. Native. Area 9 8 7 6 5 4 3 2. Range 0-500. Walls and dry banks, frequent, ascending from the coast sandhills to the Main Limestone scars of the Buttertubs Pass.

*Sedum sexangulare* L. Alien. Occasionally subspontaneous on walls and roofs. Stokesley, Lofthouse, Castleton, Scarbro'.

*S. reflexum* L. is frequently and *S. elegans* Ley. occasionally subspontaneous on walls and roofs, but I have not seen either of them in stations at all likely to be natural: and *Sempervivum tectorum* is common under similar circumstances.

6 *Cotyledon Umbilicus* L. Native. Area 7. Range 150. Reported by the Revd. J. E. Leeke as having been found by Miss Otter on walls in Wensleydale at West Witton.

*Saxifraga Geum* and *S. umbrosa* are both occasionally subspontaneous in plantations and parks, as for instance on the bank of the Wharfe above Thorp Arch. The latter is apparently a native of Craven.

4 *S. stellaris* L. Native. Montane. Area 9. Range 350-800. In Teesdale upon the slopes of Mickelfell towards the Lune and Maze beck, and along the Tees as far as the High force.

7 *S. Hirculus* L. Native. Montane. Area 9. Range 350-700. In Teesdale in three places on the slope of Mickelfell towards the Caldron Snout, one of them not much below the summit ridge. In Balderdale on the banks of the Black beck near its junction with the Balder, and also in rills near the Balder about midway between the other station and the highest farmhouse in the dale.

4 *S. aizoides* L. Native. Montane. Area 9 7. Range 350-750. In Teesdale along with *S. stellaris* about Mickelfell and Upper Cronkley. It has been seen down the river at Pierse bridge, no doubt casually carried down: and is also reported from Whitfell gill in Wensleydale.

1 *S. granulata* L. Native. Area 9 8 7 5 4 3 2. Range 0-500. Frequent in fields and upon rocks in Teesdale and elsewhere amongst the hills, ascending to Cronkley scars, and occasionally also in the Central Valley, as at Kirklington, Northallerton and Hutton Conyers.

1 *S. tridactylites* L. Native. Area general. Range 0-650. Common upon walls and rocks, ascending to the limestone pavement of Widdale fell, and the Main Limestone scars of Booze moor.

3 *S. hypnoides* L. Native. Montane. Area 9 8 7. Range 300-850. Confined to the western hills, where it is frequent throughout the two upper zones. It ascends to the peaks of Mickelfell, Widdale fell and Camfell, and descends to Gunnerside and Appersett bridge.

1 *Chrysosplenium oppositifolium* L. Native. Area 9 8 7 5 4 3 2 1. Range 0-800. Frequent in damp places amongst the hills, ascending to the Main Limestone of Mickelfell. In the Central Valley by the Tees side at Croft.

1 *Chrysosplenium alternifolium* L. Native. Area general. Range 0-750. Frequent in similar situations to the preceding, ascending to the springs which issue from the Main Limestone of Micklefell.

3 *Parnassia palustris* L. Native. Area 9 8 7 6 5 4 3 2. Range 0-500. Frequent in damp places amongst the hills, especially in the calcareous dales, where like *Primula farinosa* and *Blysmus compressus* it usually grows in tufaceous swamps. In the Central Valley at Carthorpe, Thirsk, Sandhutton, Askham Bryan and Newby Wiske: and amongst the coast banks at Lofthouse, Whitby and Scarbro'.

1 *Adoza moschatellina* L. Native. Area 9 8 7 5 4 3 2. Range 0-300. Frequent in shaded places throughout the Lower zone, ascending to the top of Whitstoncliff woods.

1 *Hedera Helix* L. Native. Area general. Range 0-450. Common upon trees, banks and rocks from the vallies upwards amongst the hills, ascending to Fossdale woods and Hell Gill, and the Main Limestone scars of Harlen fell and Copperthwaite moor.

2 *Cornus sanguinea* L. Native. Area general. Range 0-300. Frequent in woods and hedgerows throughout the Lower zone, ascending on the west to the Red Scar near Downholme, and on the east to Hawaby Bank.

4 *C. suecica* L. Native. Montane. Area 3. Range 150-250. On the edge of the slope of the Middle Oolite near the head of the Hole of Horcum; also at Crosscliffe banks and lower down the Derwent near Hackness. Except *Carex pauciflora* the only Montane plant noted in East Yorkshire which does not occur also amongst the hills on the west of the Central Valley.

1 *Hydrocotyle vulgaris* L. Native. Area general. Range 0-300. Frequent in swamps throughout the Lower zone.

1 *Sanicula europæa* L. Native. Area general. Range 0-350. Frequent in woods, especially amongst the hills, ascending in Wensleydale to Shaw's gill near Hardraw.

1 *Eryngium maritimum* L. Native. Maritime. Area 5 3. Range C.L. Upon the seabank near Lazenby station, *Ferguson*. Cliff beyond the Spa at Scarbro', *Flora*, and said also to have been found near Cloughton.

1 *Conium maculatum* L. Native. Area general. Range 0-300. Common in shaded and damp places throughout the Lower zone, ascending in Swaledale to Muker, in Wensleydale to Sedbusk.

2 *Smyrniolus Olusatrum* L. Denizen. Area 6 5 4 3 2. Range 0-100. Plentiful upon the cliff at Whitby, and the castle hill at Scarbro'. Inland

at Northallerton, in a wood at Pinchinthorpe, in the churchyard at Wig-hill, and by the Tees side at Hurworth.

2 *Cicuta virosa* L. Native. Area 8 3 2. Range 0-100. In the Central Vale in Ainderby Carr and Newsham Carr. In the Vale of Pickering near the Derwent along Old Malton ings.

2 *Apium graveolens* L. Native. Maritime. Area 5 4 3. Range C.L. Plentiful about the salt water ditches at Middlesbro' and Coatham, and about the lower part of the Esk; and occuring also at Saltburn, Runswick and Scarbro'.

*Petroselinum sativum* Hoffm. Alien. Commonly cultivated in gardens, ascending to 500 yards, and occasionally subspontaneous. A native of the South of Europe.

2 *Helosciadium nodiflorum* Koch. Native. Area general. Range 0-250. Common in watery places in the low country, ascending in Swaledale to Summer lodge beck near Crackpot.

1 *H. inundatum* Koch. Native. Area 9 8 6 5 4 3 2 1. Range 0-550. Frequent in swamps and ponds both in the low country and amongst the hills, ascending to a pond upon the plateau of Cronkley fell.

1 *Egopodium Podagraria* L. Native. Area 9 8 7 6 5 3 2 1. Range 0-250. Frequent by streamsides and in shaded places in the low country, ascending in Swaledale to a wood near the Marrick smelting mill.

*Carum Carui* L. Alien. Casually subspontaneous in waste ground. Richmond, Sober Hill, Cargfleet, Scarbro', &c.

1 *Bunium flexuosum* With. Native. Area general. Range 0-450. Common in grassy places from the vallies upwards to the Middle zone moorlands, ascending to Whitstondale scars.

1 *Pimpinella Saxifraga* L. Native. Area general. Range 0-500. Frequent on dry banks and in grassy places, ascending to Cronkley Scares, and the Main Limestone scars of Booze moor and Copperthwaite moor.

2 *P. magna* L. Native. Area 8 7 6 3 2 1. Range 0-150. Not un-frequent in the low country in sandy and gravelly ground. Richmond, Bedale, Crakehall, Tanfield, Thorp Arch, York, Thirsk, Easingwold, Oulston, Coxwold, &c.

2 *Sium latifolium* L. Native. Area 5 3 1. Range 0-100. Stream-sides and ditches in the vales, rare. In the Central Vale in Coatham marshes and several places about the lower part of the Foss. About the Derwent from the mouth of the Rye past Malton to Crambeck.

2 *S. angustifolium* L. Native. Area 8 7 6 5 3 2 1. Range 0-150. Watery places, frequent in the vales, and occasionally beyond their limits. Ravensworth, Sedbury, Morton Carr, Flazendale, Beckdale, &c.

5 *Bupleurum rotundifolium* L. Colonist. Area 8 7 5 3 2. Not unfrequent in cultivated fields in the low country. Kiplin, Hutton, Spennithorn, Nosterfield, Snape, Dishforth, Northallerton, Crathorn, Barton, Slingsby, Malton, &c.

2 *Enanthe fistulosa* L. Native. Area 9 8 6 5 3 2 1. Range 0-100. Frequent in watery places in the low country.

1 *Æ. crocata* L. Native. Area 7 5 3. Range 0-100. Rare in watery places in the low country. In a wood near the bridge over the Yore between Leyburn and Middleham. In the Central Vale about the Tees at Yarm. In the Vale of Pickering about the Derwent from the mouth of the Rye downward.

2 *Æ. Lachenalii* Gmel. Native. Area 8 5 2. Range 0-100. Rare in watery places in the Central Valley. By the Tees side at Stockton, near the mill-dam at South Otterington, and in boggy ground between Cundall and Dishforth.

2 *Æ. Phellandrium* Lam. Native. Area 9 8 7 6 3 2 1. Range 0-100. Frequent in watery places in the low country.

1 *Æthusa Cynapium* L. Colonist. Area general. Range 0-200. Common in cultivated fields, ascending in Wensleydale to Carperby.

2 *Silaua pratensis* Bess. Native. Area general. Range 0-300. Frequent in grassy places throughout the Lower zone, ascending to Winch bridge and the plateau of the Hambleton range over Hawnby.

3 *Meum athamanticum* Jaeg. Native. Montane. Area 7. Range 300-350. In the Yore district in meadows at Mossdale head, *Fothergill*.

1 *Angelica sylvestris* L. Native. Area general. Range 0-550. Common in damp and shaded places both in the low country and amongst the hills, ascending to Cronkley scars, Whitstondale scars, and the falls of the Cover at the foot of Great Whernside.

7 *Peucedanum Ostruthium* Koch. Denizen. Area 9 8 7. Range 200-400. Well established in the upper part of all the three western dales, but like *Senecio saracenicus* and *Chenopodium Bonus-Henricus*, always in proximity to barns and farmhouses. In Teesdale at Lower Cronkley, Lonton and Cotherstone. In Swaledale at Raven's seat, Keld, and at the farmhouses where Sleddale beck joins the main stream of Swale. In the Yore district at Hawes, Busk (Seamerdale) and Thoraby. Still dried in some places, and hung up from the rafters to use as a medicine for cows, and no doubt originally planted for this purpose. It is called by the dale farmers "Angelica."

2 *Pastinaca sativa* L. Native. Subxerophilous. Area 8 6. Range

0-200. In Swaledale in the park at Marrick, *Ward*. In the Ainsty about the Magnesian Limestone at Thorp Arch, *Backhouse*.

1 *Heracleum Sphondylium* L. Native. Area general. Range 0-450. Common in grassy and shaded places from the vales upwards to the hill glens. It ascends to the Main Limestone scars of Punchard's gill and Harlen fell.

1 *Daucus Carota* L. Native. Area general. Range 0-300. Frequent upon dry banks throughout the Lower zone, ascending to fields of the plateau of the Hambleton range over Arden.

5 *Caucalis daucoides* L. Colonist. Area 7 6 3. Range 0-100. Cultivated fields, rare. Still to be found about the Magnesian Limestone at Nosterfield, Tanfield and Thorp Arch, whence it is recorded by Dalton and Teesdale. In the Howardian tract at Appleton, Barton and Hildenley.

1 *Torilis Anthriscus* Gaertn. Native. Area general. Range 0-450. Frequent upon hedgebanks and shaded places, ascending in Wensleydale to Preston Scar woods, and in Arkendale to the Main Limestone scars of Copperthwaite moor.

2 *T. infesta* Spreng. Colonist. Area 8 2. Range 0-100. Occasionally in cultivated fields. In the Central Vale at Carthorpe, Leeming, Kirby Wiske and Woodend. In the Vale of Mowbray upon the Lias at Sutton-under-Whitstoncliff.

2 *T. nodosa* Gaertn. Colonist. Area 9 8 6 5 4 3 2. Range 0-100. Not unfrequent in cultivated fields in the low country, especially in the more sandy portions of the Central Valley.

1 *Scandix Pecten* L. Colonist. Area general. Range 0-350. Common in cultivated fields, ascending as high as field cultivation reaches.

1 *Anthriscus vulgaris* Pers. Native. Area 8 6 5 4 3 2. Range 0-150. Frequent in sandy ground in the low country, ascending in Swaledale to Fremington.

1 *A. sylvestris* Hoffm. Native. Area general. Range 0-450. Common in grassy places both in the low country and amongst the hills, ascending to Raven's Seat, Hell gill, Fossdale woods and the Main Limestone scars of Keasdon.

*A. Cerefolium* Hoffm. Alien. Casually subsponaneous in waste ground near Great Ayton, *Mudd*! Hedgebank near a garden at Thirsk, 1859, and waste ground north of Norby by the side of Codbeck with *Erysimum cheiranthoides*.

1 *Cherophyllum temulentum* L. Native. Area general. Range 0-400. Common upon hedgebanks and in shaded places, ascending in Swaledale to the Main Limestone scars of West Stonesdale moor.

7 *Myrrhis odorata* Scop. Native. Montane. Area 9 8 7 5 4 3 2. Range 0-400. With us clearly an indigenous plant of the Montane role of dispersion, and one of the commonest Montane species we have. It is common in fields and by the side of the streams in the dales of both the western and eastern hills. It ascends in Teesdale to Upper Cronkley and in the Yore district to the point of junction of the two branches of the Cotterdale stream. It is carried down by the Tees, Swale and Yore into the Central Valley, and by the Derwent into the Vale of Pickering, but I know of it in one place only in the Central Valley apart from the streams which rise amongst the hills, and that is in a field at Sowerby near Thirsk. By the Esk at Whitby it grows side by side with some of the characteristically Maritime species. I have seen it at Coxwold and Boltby, and it occurs in the Howardian tract in several places. With us its nearest geographical allies are *Crepis paludosa*, *Trollius europæus* and *Stellaria nemorum*.

SUMMARY. Incognits and segregates excluded, 211 species come under this chapter, 27 of which are Aliens, 7 Denizens, 9 Colonists, and 168 Natives. Of those of the three latter grades of citizenship, 171 are plants of the Lower, 81 of the Middle, and 18 of the Upper zone: and they range under the types of distribution as follows, viz.; British 81, English 69, Scottish 6, Highland 8, Germanic 4, Atlantic 2, Intermediate 11, Local 4.

## CHAPTER XVII.

### COROLLIFLORE.

2 *Viscum album* L. Native. Area 6. Range 50. In the Ainsty in the woods about Nun Appleton. Formerly found upon a crab-tree at Sowerby near Thirsk.

1 *Sambucus nigra* L. Native. Area general. Range 0-450. Common in woods and hedges in the low country. Frequent in the aboriginal dale woods, and clearly indigenous at 450 yards upon the Main Limestone scars of Copperthwaite moor near Reeth, with Ivy, Holly, and Yew.

2 *S. Ebulus* L. Native. Area 9 8 7 6 5 4 3 2. Range 0-200. Clearly indigenous in, at any rate, some of its stations within our limits. Thickets and streamsides: about the Magnesian Limestone at Pierse bridge and Thorp Arch, and in the Central Valley at Melsonby, Leeming, Leckby, Hutton Conyers, Hilton (near Yarm), Otterington, Sigston, &c. It grows with *Actæa spicata* and *Rubus saxatilis* in the aboriginal woods of Beckdale; and occurs also on the Castle-hill at Scarbro', in the Esk district at Ellerby, and in the Howardian tract at Bransby.

1 *Viburnum Opulus* L. Native. Area general. Range 0-300. Frequent in woods and hedges throughout the Lower zone. It is not unfrequent in the aboriginal dale woods, and ascends in Teesdale to Winch bridge, and in Wensleydale to Preston Scar.

*V. Lantana* L. Alien. Occasionally in woods, but apparently always planted. Aske, Ormesby, Mulgrave woods, Scarbro', &c.

1 *Lonicera Periclymenum* L. Native. Area general. Range 0-450. Common in woods and hedges, ascending in Teesdale to Holwick and Blea beck scars.

*L. Caprifolium* L. Alien. Occasionally subsontaneous or planted in hedgerows. Bedale, Pickhill, Newton (Cleveland), &c. *L. Xylosteum*



also occurs occasionally under similar circumstances. Aske, Thorp Arch, Woodend, Yarm, &c. : and a single bush of *L. Etrusca* grows or grew in a hedge at Holdgate near York.

1 *Galium verum* *L.* Native. Area general. Range 0-650. Common in grassy places, ascending to the Main Limestone scars of Widdale fell.

1 *G. cruciatum* *With.* Native. Area general. Range 0-500. Common in shaded and grassy places, ascending to the summit of the Hambleton plateau over Boltby, and the moor near the Hind Rake lead mine near Reeth.

1 *G. palustre* *L.* Native. Area general. Range 0-600. Common in damp places, ascending to the ridge between Nine Standards and the source of the Swale. *G. elongatum* *Presl* is frequent, and *G. debile* *Desv.* occurs occasionally in the low country.

1 *G. uliginosum* *L.* Native. Area 8 6 3 2. Range 0-100. Not unfrequent in damp ground in the low country, ascending Swaledale to Coalsgarth.

1 *G. saxatile* *L.* Native. Area 9 8 7 5 4 3 2 1. Range 0-850. Common in heathery and grassy places from the low country upwards to the peaks of most of the higher hills: Micklefell, Dodfell, Great Whernside, &c. One of the few species which are common throughout the widest vertical range which is possible within our limits. Most likely a plant of the Ainsty, but I have no note of it as such.

5 *G. erectum* *Huds.* Native. Xerophilous. Area 3. Range 100-150. In the Howardian tract on the limestone terrace at Slingsby heights and in a quarry outside Kitscrew wood near Hovingham. Both of these stations were first found by Mr. Ibbotson, who gathered and distributed numerous specimens.

2 *G. Mollugo* *L.* Native. Area 9 8 7 6 5 4 3 2. Range 0-350. Not unfrequent in hedges throughout the Lower zone, ascending Swaledale to Keld and Thwaite, and Wensleydale to Bainbridge and Hawes. *G. insubricum* *Gaud.* grows upon a shaded hedgebank between Thirsk and Sandhutton, where it was found by Mr. T. J. Foggitt.

7 *G. pusillum* *Angl.* (*G. sylvestre* *Poll.* with *G. commutatum* *Jordan.*) Native. Montane. Subxerophilous. Area 9 8 7. Range 200-800. Frequent amongst the limestone scars of the western dales. In Teesdale it descends to the debris below Cronkley scars and ascends to the Main Limestone of Micklefell. In Swaledale it descends to Reeth and ascends to the plateau of Pin seat. In Yoredale it descends to Carperby and Aysgarth force and ascends to the Main Limestone of Widdale fell and

Ten end. Analogous to *Arenaria verna* and *Sesleria cærulea* in its distribution within our limits. All the three are both Montane and Subxerophilous, are frequent amongst the western hills from a low level up to the Main Limestone scars, and yet are entirely absent from both the two eastern ranges of hill. *Draba incana* is somewhat similar in its role, but is less abundant, and does not descend so low as these three; *Hutchinsia* is their next nearest geographical ally, but does not ascend so high.

5 *Galium tricornæ* With. Colonist. Area 7 6 5 3 2. Range 0-150. Not unfrequent in cultivated fields in the low country; Jerveaux, Thorp Arch, Bilton, Middlesbro', Redcar, Thirsk, Cleves, Appleton, Barton, Malton, &c.

*G. spurium* L. Alien. Casually subspontaneous with flax. In a flax field near Richmond, Ward! With flax by the side of a footpath near Thirsk, 1858.

*G. saccharatum* L. Incognit. Reported by Sir J. E. Smith, on the authority of R. Miller, from Malton.

1 *G. Aparine* L. Native. Area general. Range 0-400. Common in cultivated fields and upon hedgebanks and in shaded places, ascending to the oat fields of the Hambleton plateau, and in the west to the Main Limestone scars of Preston and West Stonesdale moors.

4 *G. boreale* L. Native. Montane. Area 9 8. Range 100-550. In Teesdale plentiful by the side of the stream from the White force and the falls of Maze beck downwards by way of the High force and Winch bridge to Middleton: occurring also upon the limestone below Barnard Castle, and frequently carried down and establishing itself at points lower down the river as far as Middleton locks and Yarm. In the Swale district upon Clink bank scars and by the side of the Gilling stream at Skeeby and Brompton. On the east it is reported by Teesdale from the neighbourhood of Helmsley, but has not been seen recently.

1 *Sherardia arvensis* L. Colonist. Area general. Range 0-350. Common in cultivated fields, ascending as high as field cultivation reaches.

1 *Asperula odorata* L. Native. Area general. Range 0-350. Woods and shaded banks, common amongst the hills. I have seen it in the Central Vale in two places only, a wood by the Tees side between Croft and Stapleton, and a hedgebank between Cotcliffe and Northallerton.

2 *A. Cynanchica* L. Native. Xerophilous. Area 6. Range 100. About the Magnesian Limestone by the Wharfe side at Thorp Arch. This is the most northern station for the species on the east side of Britain, but, unlike the generality of the Xerophilous species, it ascends further north on the west than on the east side of the island.

*Asperula arvensis* L. Casually subspontaneous in a forage field near Camphill, 1858, *Hebblethwaite*!

*Centranthus ruber* D.C. Alien. A species much cultivated in gardens which is occasionally subspontaneous on old walls. Bolton Castle, Masham, Whitby, Helmsley, &c. A native of Italy and the south of France.

2 *Valeriana dioica* L. Native. Area general. Range 0-600. Frequent in damp places, ascending in Teesdale to the plateau of Cronkley fell.

1 *V. officinalis* L. with *V. sambucifolia* Mikan. Native. Area general. Range 0-550. Frequent in ditches and damp places, ascending to Cronkley and White Force scars and the Main Limestone cliffs of Punchard's gill.

1 *Fedia olitoria* Vahl. Colonist. Area 8 7 6 5 4 3 2 1. Range 0-200. Frequent in cultivated fields in the low country, ascending in Wensleydale to Carperby.

2 *F. carinata* Stev. Colonist. Area 8. Range 50. Sent by Mr. Umpleby from the railway embankment near Mawnby. The reported Wensleydale station seems to be quite unlikely for the plant.

2 *F. Auricula* D.C. Colonist. Area 2. Range 50. Found in plenty by Mr. T. J. Foggitt in cultivated fields between Thirsk and Sandhutton.

2 *F. dentata* Bieb. Colonist. Area general. Range 0-200. Frequent in cultivated fields in the low country.

2 *Dipsacus sylvestris* L. Native. Area general. Range 0-100. Not unfrequent in sandy ground in the low country. It is not anywhere plentiful, but has been noted in all the nine drainage districts. *D. Fullonum* is occasionally cultivated.

2 *D. pilosus* L. Native. Subxerophilous. Area 8. Range 150. In Swaledale, found by Mr. Ward in Whitcliff wood near Applegarth. The most northern British station.

1 *Scabiosa succisa* L. Native. Area general. Range 0-600. Common in grassy places both in the low country and amongst the hills, ascending to the plateau of Cronkley fell.

*S. columbaria* L. Native. Subxerophilous. Area 9 8 7 6 5 4 3 2. Range 0-550. Frequent upon rocks and dry banks in the limestone country both east and west of the Central Valley, ascending to Boltby scar, Hell gill, and the Main Limestone cliffs of Harlen fell, Booze moor and Copperthwaite moor. In the Central Vale at Carthorpe, Thirsk, Leckby, and by the Tees side between Croft and Stapleton. About the Lower Oolite at Boltby and Welburn. In Cleveland on the basaltic dike at

Langbargh, and amongst the sea banks at Marske, Saltburn and Upgang. Analogous in its distribution within our limits to *Poterium Sanguisorba* and *Carlina vulgaris*, the three being the most widely diffused and commonest Flowering plants with well-marked Xerophilous restriction which we have. *Anthyllis Vulneraria* and *Cerastium arvense* are perhaps as plentiful, but they are not so characteristically Xerophilous.

1 *Knautia arvensis* Coult. Native. Area general. Range 0-300. Frequent in grassy places throughout the Lower zone, ascending in Teesdale to Winch bridge.

1 *Tragopogon pratensis* L. with *T. minor* Fries. Native. Area general. Range 0-300. Frequent in grassy places throughout the Lower zone, ascending in Swaledale to Gunnerside, and in Arkendale to Langthwaite.

1 *T. porrifolius* L. Denizen. Area 5 3. Range 0-150. In Cleveland on the borders of fields on the Ayton slope of Cliff-rig, *Mudd!* At Scarbro' it sprung up spontaneously in a plantation and continued for several years, but is now extinct, *Bean!* Reported also by Ibbotson from the neighbourhood of Pickering.

2 *Helminthia echioides* Gärtn. Native. Area 6 5 4 3. Range 0-100. About the Magnesian Limestone at Thorp Arch. Roadside between Marske and Upleatham. Frequent in dry sandy ground along the coast line; South Stockton, Middlesbro', Lazenby, Redcar, Marske, Ruswarp, Scarbro'.

2 *Picris hieracioides* L. Native. Area 9 8 6 5 3. Range 0-100. Not unfrequent on dry banks in the low country. About the western limestone at Middleton Tyas and Thorp Arch. In the Central Vale at Carthorpe, Knavesmire, and by the Tees side at Cleasby. In Cleveland at Battersby and Teme bridge. Along the Middle Oolite frequent from Rievaulx eastward by way of Hovingham and Castle Howard to Hackness and Scarbro'.

2 *Thrinicia hirta* Roth. Native. Area 8 3 2 1. Range 0-100. Not unfrequent in dry sandy ground in the low country.

2 *Apargia hispida* Willd. Native. Area general. Range 0-600. Common in grassy places, ascending in Widdale to the edge of the Upper zone.

1 *A. autumnalis* Willd. Native. Area general. Range 0-700. Common in grassy places, ascending nearly to the head of Punchard's gill and to the slope of Micklefell towards the Cronkley plateau.

*Hypochaeris glabra* L. Incognit. Reported from two or three stations, but upon investigation they turn out to be erroneous.

1 *H. radicata* L. Native. Area general. Range 0-500. Common upon grassy banks, ascending in Teesdale to the falls of Maze beck.

5 *Lactuca virosa* L. Native. Subxerophilous. Area 8 7 6 5 4 3 2 1. Range 0-150. In the west on the walls of Richmond castle, Easby abbey and Jerveaux abbey, and about the Magnesian Limestone at Thorp Arch. In the Central Valley in dry ground at Acomb, Rufforth, Skip bridge, Tang hall, Sandhutton, Thornton-le-street, &c. In Cleveland at Stokesley and in Mulgrave woods. On the east at Byland Abbey, Appleton-le-street and Cayton.

2 *L. muralis* Less. Native. Area general. Range 0-450. Frequent in woods and shaded places, especially amongst the hills, ascending to Upper Whitfell force, Hell gill and the Main Limestone scars of Harlen fell, Copperthwaite moor and Punchard's gill.

1 *Sonchus arvensis* L. Colonist. Area general. Range 0-300. Common in cultivated fields throughout the Lower zone, ascending to the oat fields of the Hambleton plateau over Hawnby.

1 *S. asper* Hoffm. Native. Area general. Range 0-400. Common in waste ground, ascending to the Underset limestone scars of the western slope of Keasdon, and the Main Limestone scars of West Stonesdale moor.

1 *S. oleraceus* L. Native. Area general. Range 0-400. Common in waste ground, ascending, with the preceding, to Hook mill scar, Keasdon.

1 *Crepis virens* L. Native. Area general. Range 0-350. Common in cultivated fields and on grassy banks, ascending to the Hambleton plateau above Bolthby. *C. agrestis* W. & K. occurs occasionally in cultivated fields.

5 *C. biennis* L. Colonist. Area 5. Range 100. In Cleveland in cultivated fields near Great Ayton, *Mudd!*

7 *C. succisæfolia* Tausch. Native. Montane. Area 9. Range 150-300. In Teesdale about the river at Winch bridge and below Holwick, and I have gathered it also in fields at the lower part of Deepdale, within a mile of Barnard castle.

3 *C. paludosa* Mench. Native. Montane. Area 9 8 7 5 4 3 2 1. Range 0-500. Common in damp woods in the dales and glens of both the eastern and western hills. It ascends to Blea beck scars, Hell gill, Fossdale woods, Upper Whitfell force and the Main Limestone crags of Punchard's gill. Rare in the Central Valley; meadows at Thirsk and Aisenby, and woods by the Tees side at Croft.

1 *Hieracium Pilosella* L. Native. Area general. Range 0-800. Common upon grassy banks, ascending to the Main Limestone of Micklefell and Camfell.

*H. aurantiacum* L. Alien. Occasionally subspontaneous in parks and

plantations. By the Tees near Wycliffe hall, *Ward*. In Cleveland in woods at Wilton, *Mudd*! Indigenous in France and Scandinavia.

4 *Hieracium anglicum* Fries. Native. Montane. Area 9 8. Range 300-500. In Teesdale at the White force and about the streamside at the falls of Maze beck and Winch bridge. In the Swale district at Whitstondale, East Stonesdale and Cliff gill, and near the Swale above Keld.

4 *H. iricum* Fries. Native. Montane. Area 9. Range 300-550. In Teesdale on Cronkley and the White force scars, and by the streamside at the High force and Winch bridge.

4 *H. pallidum* Biv. Native. Montane. Area 9. Range 300-550. In Teesdale on Cronkley and Holwick scars, and by the streamside at Winch bridge.

1 *H. murorum* L., *Backh. monogr*! Native. Montane. Area 9 8 7 3 2. Range 100-450. Frequent in the western dales; Winch bridge, Lunedale, Balderdale, Whitstondale, Keasdon, Gunnerside gill, Arkendale, Hell gill, Cotterdale, Hardraw force, Whitfell gill, Tanfield, &c. On the east amongst the Hambleton hills in several places; Hawaby bank, Sutton bank, Boltby scar, &c.

3 *H. caesium* Fries, *Backh. monogr*! Native. Montane. Area 8 7 3 2. Range 100-500. With a similar range to the preceding, in company with which it often grows, but somewhat less frequent. In the west at Whitstondale scars, Keasdon force, Low Row, Gunnerside gill, Arkendale, Applegarth scars, Downholme scars, Harlen fell scars, Aysgarth force, Tanfield, &c. Amongst the Hambleton hills in the same stations as the preceding, and I have also seen it on the freestone crags near the head of Newtondale, and received it from Forge valley (Reynolds).

1 *H. vulgatum* Fries. Native. Area general. Range 0-550. Frequent in woods and upon walls and rocks both in the low country and amongst the hills, ascending to Cronkley scars and the Main Limestone cliffs of Booze moor and Punchard's gill.

4 *H. gothicum* Fries. Native. Montane. Area 9 8 7 5. Range 150-400. In Teesdale about the river at the High force and Winch bridge, and in Deepdale at the waterfalls. In the West Swale district on Whitstondale scars, the Main Limestone scars of West Stonesdale moor, and Hook mill scar near Keld. In Cleveland it has been found by Mr. Mudd in Midnight wood near Ingleby, and I have gathered a curious broad-leaved form in Lounsedale. A specimen from Wensleydale is in the herbarium of Mr. Hardy of Manchester.

2 *H. tridentatum* Fries. Native. Area 9 8 7 4 3 2. Range 0-400.

Not unfrequent in woods from the Central Valley upwards to the Middle zone. Winch bridge, Whitstondale, Keasdon force, Low Row, Feethams, Aysgarth force, Wensley, Croft, Hutton moor, Woodend, Thirsk, Sutton-under-Whitstoncliffe, Guisbro', Flazendale, Nettle Dale, &c.

4 *Hieracium prenanthoides* Vill. Native. Montane. Area 8 7. Range 300-450. In Swaledale in the woods on the northern slope of Keasdon from the Main Limestone scars down to the river. In the Yore district at Upper Whitfell force. It grows on the south side of the Yore at Hackfall, just beyond our limits, at a much lower level than we appear to have it.

4 *H. crocatum* Fries. Native. Montane. Area 9 8 7 5. Range 250-400. Not unfrequent by the side of the dale streams in the west. About the Tees at Lower Cronkley, Winch bridge and downward to Middleton. In the West Swale district in Whitstondale, and near the Swale at Keasdon force and below Crackpot Hall. In the Yore district at Gale force, Upper Whitfell force, and in Fossdale woods. In Cleveland in Midnight woods near Ingleby.

4 *H. corymbosum* Fries, *H. rigidum* Backh. monogr! Native. Montane. Area 9 8 7. Range 150-400. About the Tees at Lower Cronkley, Winch bridge and below Holwick. In the West Swale district in Whitstondale, near Hudswell, and on Kirby hill near Ravensworth. In the Yore district in Fossdale woods.

1 *H. boreale* Fries. Native. Area general. Range 0-400. Common in woods and upon heaths, ascending in Swaledale to Raven's seat.

1 *H. umbellatum* L. Native. Area general. Range 0-400. Frequent in similar situations to the preceding, and with the same vertical range.

*Borkhausia setosa* D.C. Alien. Casually subsponaneous in cultivated fields. Sowerby, Carlton Miniott, Great Ayton, Seamer, Kirby in Cleveland, &c.

1 *Taraxacum officinale* Wigg. Native. Area general. Range 0-800. Everywhere common in waste and grassy places, ascending to the Main Limestone of Mickelfell and Camfell. Of the segregate species we have *T. levigatum*, *palustre* and *udum*.

1 *Lapsana communis* L. Native. Area general. Range 0-350. Common upon hedgebanks and in cultivated fields throughout the Lower zone, ascending in Arkendale to Shaw woods.

2 *Cichorium Intybus* L. Colonist. Area 8 6 5 3 2 1. Range 0-150. Occasionally cultivated in the low country, especially in the neighbourhood of York, and not unfrequent in a subsponaneous state as a weed of

cultivated ground. Skeeby, Catterick Bridge, Burniston, Ainderby Quernhow, Thorp Arch, York, Great Ayton, Thirsk, Sheriff Hutton, Heworth, Barton, Malton, &c.

1 *Arctium Lappa* L. Native. Area general. Range 0-400. Common in waste places and by roadsides throughout the Lower zone, ascending to the plateau of the Hambleton range above Boltby, and the Main Limestone scars of West Stonesdale moor. *A. minus* Schk. is the common segregate species, and we have also *A. intermedium* and *pubens*, both of which are considered as forms of *minus* by Professor Crepin, who has lately studied these plants carefully, and who admits the distinctness of *A. majus* and *tomentosum*, neither of which I have seen within our limits.

2 *Serratula tinctoria* L. Native. Area 9 8 7 6 5 3 2 1. Range 0-300. Frequent in woods and fields amongst the hills, ascending in Teesdale to Winch bridge. Rare in the Central Valley; Newby Carrs, Askham bogs, Woodend, Sandhutton, &c.

2 *Carduus nutans* L. Native. Area general. Range 0-550. Frequent in waste ground both in the low country and amongst the hills, ascending to the peak of Booze moor and the Main Limestone of Askrigg moor.

1 *C. acanthoides* L. with *C. crispus* L. Native. Area general. Range 0-300. Frequent in waste ground throughout the Lower zone, ascending to the plateau of the Hambleton range over Hawnby.

2 *C. tenuiflorus* Curt. Native. Maritime. Area 5 4. Range C.L. Frequent along the coast line by way of Middlesbro', Coatham, Redcar, Saltburn and Whitby.

2 *C. Marianus* L. Denizen. Area 9 8 7 6 4 3 2 1. Range 0-100. Not unfrequent in waste places in the low country. Lartington, Tanfield, Carthorpe, Dishforth, Aisenby, Thirsk, Acomb, Pilmoor, Mowthorpe dale, Ayton (near Scarbro'), &c. Upon the coast banks at Huntcliffe, Runswick Bay and on the Scarbro' castle hill.

1 *C. lanceolatus* L. Native. Area general. Range 0-650. Common in waste ground, ascending to the Main Limestone of Camfell and Widdale fell.

2 *C. eriophorus* L. Native. Xerophilous. Area 8 6 3 2. Range 0-250. About the Magnesian Limestone at Thorp Arch. In the Central Valley at Kirklington, Leckby and Thorpfield. Along the Middle Oolite frequent from Old Byland and Helmaley by way of Oswaldkirk, Hovingham and Pickering to Hackness and Scarbro'.

1 *C. palustris* L. Native. Area general. Range 0-700. Common in damp places both in the low country and amongst the hills, ascending to



the peak of Nine Standards and the limestone pavement of Widdale fell.

1 *Carduus arvensis* Curt. Native. Area general. Range 0-700. Common in fields and waste places, ascending to the Main Limestone of Camfell and nearly to the summit of Widdale fell.

2 *C. pratensis* Huds. Native. Area 6 3 2 1. Range 0-100. In several places amongst the heaths of the Central Valley. Pilmoor, Askham bogs, Buttercrambe moor, and on Stockton forest between Strensall and Hasel bush.

3 *C. heterophyllus* L. Native. Montane. Area 9 8 7 3. Range 150-400. Frequent in damp places in the western dales, ascending to Raven's seat and Fossdale woods, descending to Greta bridge, Marske and Aysgarth force. Amongst the eastern hills in the upper part of Newtondale.

*Onopordum Acanthium* L. Alien. Subspontaneous in waste ground at Camphill, *Hebblethwaite*!

2 *Carlina vulgaris* L. Native. Subxerophilous. Area 9 8 7 6 5 4 3 2. Range 0-400. Frequent in the limestone country both upon the west and the east of the Central Valley, and occasionally upon the Gritstone and Lower Oolite, as at Guisbro', Levisham, and in Gurtof gill. In the Central Valley at Burniston, Kirklington, and by the Tees side near Dalton. Amongst the coast sandhills at Redcar, Marske, Saltburn, Sandsend and Whitby.

*Centaurea montana* L. Alien. Casually subspontaneous in Swaledale near the Round Howe, *Ward*. A native of France and Belgium.

1 *C. nigra* L. Native. Area general. Range 0-550. Common in grassy places, ascending to the White force scars, and the Main Limestone cliffs of Keasdon and Copperthwaite moor. The radiate form is not unfrequent.

1 *C. Cyanus* L. Colonist. Area 8 7 6 5 4 3 2. Range 0-100. Not unfrequent in cultivated fields in the low country.

1 *C. Scabiosa* L. Native. Area 9 8 7 6 5 4 3 2. Range 0-300. Frequent upon dry banks throughout the Lower zone, ascending to the summit of Leyburn Shawl.

*C. Calcitrapa* L. Incognit. A specimen from Sandsend is in the Middleton herbarium in York Museum, but the species has not been seen recently.

*C. solstitialis* L. Alien. Casually subspontaneous in cultivated fields at Leeming Lane, *Simpson*!

*Calendula officinalis* L. Alien. An occasional straggler from garden cultivation. Middleton Tyas, Carperby, Carlton Miniott, Esk side near Lealholme bridge, &c. A native of Spain and Italy.

2 *Bidens cernua* L. Native. Area 8 4 3 1. Range 0-100. Watery places in the low country, rare. Bolton-on-Swale, Kirklington, Camphill, Swainby, Mawnby, Sheriff Hutton, Castle Howard, Cayton Carr.

2 *B. tripartita* L. Native. Area 8 5 4 3 2. Range 0-150. In similar situations to the preceding, and somewhat more frequent. Bolton-on-Swale, Camphill, Mawnby, Newton (Cleveland), Castleton, Thirlby, Woodend, Sandhutton, Bulmer, Terrington, Raincliffe wood near Scarbro'.

1 *Eupatorium cannabinum* L. Native. Area general. Range 0-200. Frequent in watery places in the low country, ascending to Kewick and Aysgarth force.

1 *Tanacetum vulgare* L. Native. Area general. Range 0-200. Frequent by streamsides and in waste ground in the low country, ascending in Bilsdale to Chop Yate. Cultivated in gardens up to 350 yards.

2 *Artemisia maritima* L. Native. Maritime. Area 5 4. Range C.L. Along the coast-line frequent at Middlesbro' and Coatham, and more sparingly at Saltburn and about the Esk at Whitby.

2 *A. Absinthium* L. Denizen. Area general. Range 0-250. Frequent in waste places in the Lower zone, but so far as I have seen, always in the neighbourhood of houses and gardens.

1 *A. vulgaris* L. Native. Area general. Range 0-300. Frequent in hedgerows and waste ground throughout the Lower zone, ascending in Gretadale to Bowes, and in Arkendale to Langthwaite.

3 *Gnaphalium dioicum* L. Native. Montane. Area 9 8 7 6 5 4 3 2. Range 100-600. Frequent in grassy places amongst both the eastern and western hills, ascending to the sugar limestone of Cronkley fell, descending to Thorp Arch, Rievaulx terrace and the peaks of the Howardian tract.

*G. margaritaceum* L. Alien. A common garden plant which is spontaneous in two or three places. By the Swale side near Whitcliffe mills, Ward: and lower down near Brompton, Simpson. Amongst the coast cliffs about three miles south of Scarbro', Black!

1 *G. sylvaticum* L. Native. Area 8 6 5 4 3 2 1. Range 0-300. Frequent upon grassy heaths throughout the Lower zone.

1 *G. uliginosum* L. Native. Area general. Range 0-200. Frequent in cultivated fields and damp places in the low country.

1 *Filago minima* Fries. Colonist. Area 8 7 6 3 1. Range 0-150. Sandy fields in the low country, rather rare. Bedale, Hutton moor, Acomb, Stockton, Strensall, Yearsley moor, Scarbro'.

1 *F. germanica* L. Colonist. Area 8 7 6 5 4 3 2 1. Range 0-300.

Common in cultivated fields throughout the Lower zone, ascending to the flagstone quarries of Leyburn moor.

1 *Petasites vulgaris* Desf. Native. Area general. Range 0-300. Common in damp places and about streams throughout the Lower zone, ascending to Hawes, Lonton and Shaw wood in Arkendale.

1 *Tussilago Farfara* L. Native. Area general. Range 0-600. Common in waste places, ascending to the plateau of Cronkley fell and above the Main Limestone in Punchard's gill.

2 *Erigeron acris* L. Native. Area 8 7 3 2. Range 0-100. Dry banks in the low country, rare. In the West Swale district at Easby Abbey, and about the Magnesian Limestone at Well and Thorp Arch. In the Central Valley at Carthorpe, Camphill, Newby Wiske, Newsham, Dishforth and Thirsk. On the Middle Oolite at Malton, and between Helmsley and Brandsby.

1 *Aster Tripolium* L. Native. Maritime. Area 5 4. Range C.L. Plentiful about the salt-water ditches at Middlesbro' and Coatham. Banks of the Esk at Whitby.

*A. puniceus* L. Alien. Well-established on the Yorkshire side of the Tees about midway between Yarm and Low Worsall, where it was first noticed many years ago by Mr. T. J. Foggitt. It now extends for a couple of yards along the bank of the river. I am not quite certain about the name, but believe the plant to be a narrow-leaved form of the American *A. puniceus*.

1 *Solidago Virgaurea* L. Native. Area 9 8 7 6 5 4 3 2. Range 0-550. Frequent amongst the hills of both east and west, especially by the streamsides where they break through the limestone. It grows also in the Howardian tract, upon the basaltic dike in Cleveland, and amongst the coast banks at Mulgrave, Robin Hood's bay and Scarbro'. In the Central Valley I know of it in one station only, a wood by the Tees side at Stapleton.

1 *Senecio vulgaris* L. Native. Area general. Range 0-400. Common in waste places, ascending to Upper Cronkley, Sleightholme and Keld.

1 *S. sylvaticus* L. Native. Area general. Range 0-300. Frequent upon sandy heaths throughout the Lower zone, ascending to the flagstone quarries of Leyburn moor. *S. viscosus*, except as an Alien, is quite doubtful as a plant of our limits.

2 *S. erucifolius* L. Native. Area general. Range 0-150. Frequent upon hedgebanks in the low country.

1 *S. Jacobæa* L. Native. Area general. Range 0-550. Common in

fields and about roadsides, ascending to the Main Limestone of Askrigg moor and the limestone plateau of Keasdon.

1 *Senecio aquaticus* Huds. Native. Area general. Range 0-400. Common in damp places, ascending nearly to the head of Coverdale, and in Gretadale to Sleightholme.

7 *S. saracenicus* L. Denizen. Area 7. Range 350-400. In the West Swale district about a barn at the bottom of Whitstondale, and abundant near a farmhouse called Close hills in the same dale. With us evidently an introduced species, but now well established. Formerly in repute as a woundwort, and probably planted long ago to use for this purpose.

*Doronicum Pardalianches* L. Alien. Occasionally subspontaneous in the neighbourhood of parks and gardens. Lartington, Marske, Swinton, Tanfield, Warlabby, Holme, Thirsk, Great Ayton, Pinchinthorpe, Mulgrave woods, &c.

*D. plantagineum* L. Alien. Like the preceding, but rare. At Leyburn near the bleach yard, Ward. In a wood at Kirklington, Simpson! Beneath the trees near the lodge on the Foss side of Newburgh Park. Our plant has cordate-amplexicaul stem leaves, and is perhaps *D. scorpioides* Willd.

2 *Inula Helenium* L. Native. Area 5 4 3 2 1. Range 0-150. In the Central Valley at North Kilvington (station now enclosed), and near the Ouse at Overton. Amongst the eastern hills truly wild in several places; Slip gill near Rievaulx, Goathland dale, Grosmont, Newtondale, Mulgrave woods, Mowthorpe dale, Hayburn Wyke.

2 *I. Conyza* D.C. Native. Xerophilous. Area 6 3. Range 0-100. About the Magnesian Limestone by the Wharfe side at Thorp Arch, and on the Middle Oolite at the east end of Cawklees wood near Nunnington.

2 *Pulicaria dysenterica* Gærtn. Native. Area general. Range 0-200. Common in damp places in the low country, ascending to Cotherstone and the upper part of Newtondale.

1 *Bellis perennis* L. Native. Area general. Range 0-800. Everywhere common in grassy places, ascending to the Main Limestone of Camfell and Micklefell.

1 *Chrysanthemum segetum* L. Colonist. Area 8 7 6 5 4 3 2. Range 0-100. Not unfrequent as a weed of cultivated fields in the low country. Sinderby, Skipton bridge, Howe-upon-Swale, Thorp Arch, Breckenborough, Thirsk, Great Ayton, Sutton-on-Derwent, Malton, &c.

1 *C. Leucanthemum* L. Native. Area general. Range 0-400. Common in grassy places, ascending to Upper Cronkley and Raven's Seat.

1 *Pyrethrum Parthenium* Smith. Denizen. Area 9 8 7 6 5 4 3 2. Range 0-250. Frequent upon hedgebanks and in waste ground, but always in the vicinity of gardens and farmhouses. Commonly cultivated in cottage gardens up to 350 yards.

1 *P. inodorum* Smith. Native. Area general. Range 0-300. Common in cultivated fields and waste ground, ascending from the Coatham salt marshes to the flagstone quarries of Leyburn moor.

2 *Matricaria Chamomilla* L. Colonist. Area 8 6 3 2. Range 0-100. Not unfrequent in cultivated fields in some parts of the low country.

2 *Anthemis nobilis* L. Native. Area 4 3. Range 0-100. Sandy and grassy places, rare. Terrington common, *Teesdale*. Lastingham near Pickering, *Flora*. By the Esk side below Ainthorp bridge.

2 *A. arvensis* L. Colonist. Area general. Range 0-300. Frequent in cultivated fields throughout the Lower zone, ascending to the plateau of the Hambleton range above Hawaby.

2 *A. Cotula* L. Colonist. Area general. Range 0-300. Equally frequent to the preceding in similar situations, and with the same vertical range.

1 *Achillea Ptarmica* L. Native. Area general. Range 0-750. Common in grassy places, ascending to the slope of Mickelfell towards the Cronkley plateau.

1 *A. Millefolium* L. Native. Area general. Range 0-800. Common in grassy places, ascending to the Main Limestone of Mickelfell and Camfell.

*A. tomentosa* L. Alien. A casual straggler from garden cultivation. Stokesley, *Mudd!* A native of Spain and the south of France.

1 *Campanula rotundifolia* L. Native. Area general. Range 0-800. Common in grassy places, ascending to the Main Limestone of Mickelfell, Widdale fell and Camfell.

2 *C. patula* L. Native. Area 5 4. Range 0-100. By the Tees side near Yarm, *T. J. Foggitt!* By the Esk side near Ruswarp, *Mudd!*

2 *C. Rapunculus* L. Denizen. Area 5. Range 150. In Cleveland on hedgebanks on the Ayton slope of Cliff rig, *Mudd!* Reported also from Forge valley.

3 *C. latifolia* L. Native. Area general. Range 0-400. Frequent in damp woods and by streamsides, ascending to Fossdale woods, Hunter's hall in Coverdale, and the Main Limestone scars of West Stonesdale moor. The most decided example of a species of the Scottish type of distribution which is frequent in the low country which we have.

*C. rapunculoides* L. Alien. Not unfrequent as a garden weed and

occasionally subspontaneous in waste ground. Scruton, Thirsk, Great Ayton, &c.

5 *Campanula glomerata* L. Native. Subxerophilous. Area 8 7 6 3 1. Range 0-250. Amongst the western limestones at Richmond, Aysgarth, Thornton Watlas and Nosterfield. In the Central Valley in sandy ground in several places; Kirklington, Bedale, Dishforth, Pickton, Ainderby Steeple, South Stockton, Northallerton, Askham Bryan, and near the Ouse along Clifton Ings. Amongst the limestone hills of the east, ascending to the Hambleton plateau near Hawaby, and frequent about Hovingham and Malton. About the arenaceous Howardian terrace at Welburn, Ganthorpe and Terrington. It is sometimes a plant of grassy places and dry banks, sometimes of cornfields. Allied in its distribution to *Cerastium arvense* and *Anthyllis*.

2 *C. Trachelium* L. Native. Area 3. Range 100. In the Howardian tract in Mowthorpe dale, *Spruce*.

*C. persicifolia* L. Alien. Subspontaneous or planted on the north side of the Wharfe at Thorp Arch, *Hailstone*.

5 *Specularia hybrida* A. D.C. Colonist. Area 7 6 5 3 2. Range 0-100. Not unfrequent in cultivated fields in the drier tracts. Fencote, Tanfield, Thorp Arch, Howgrave, Wath, Norton Conyers, Great Ayton, Thirsk, Sandhutton, Welburn, Barton, Appleton, Coneysthorpe, Hovingham, &c.

*S. Speculum* A. D.C. Alien. Casually subspontaneous in cultivated fields. Fallow field, between Thirsk and the railway station, 1854. Field between Sandhutton and Carlton Miniott, 1858, *T. J. Foggitt*! A common agrestal weed of France and Germany.

1 *Jasione montana* L. Native. Area 7 3 2 1. Range 0-250. Sandy ground, rare. Wensleydale, *Fothergill*. Hutton moor, *Ward*. Howe Carr near Sandhutton, *T. J. Foggitt*! On Terrington Broats and by the side of the road from Huntingdon to Strensall common, *Ibbotson*. Upon the Hambleton plateau near the head of Yowlasdale.

1 *Erica Tetralix* L. Native. Area 9 8 7 5 4 3 2 1. Range 0-750. Common upon heaths, ascending to the peak of Lovely Seat. It is much more abundant than *E. cinerea* both upon the vale heaths and in the Upper zone, and the two added together are very much less plentiful than *Calluna*.

1 *E. cinerea* L. Native. Area 9 8 7 5 4 3 2 1. Range 0-650. Common upon heaths throughout the Agrarian region.

1 *Calluna vulgaris* Salisb. Native. Area general. Range 0-850.

Everywhere common upon heaths, ascending from the vale heaths to the summits of all the higher hills. Several hundreds of square miles are mainly covered with this species, and there are extensive tracts of it in all the districts except the Ainsty.

7 *Andromeda polifolia* L. Native. Area 1. Range 50. I know of this species in one station only: Strensall common, on the side nearest Stockton, where it was found by Mr. Spruce.

4 *Arbutus Uva-ursi* L. Native. Montane. Area 9. Range 350-500. In Teesdale on Cronkley and Bleabeck scars, and by the streamside above the High force.

1 *Vaccinium Myrtillus* L. Native. Area 9 8 7 5 4 3 2 1. Range 0-850. Common in heathy places, ascending from the vale heaths to the peaks of most of the higher hills.

*V. uliginosum* L. Incognit. Mentioned in Fothergill's list of Wensleydale plants, but not otherwise known to me as a North Yorkshire species. It occurs in Teesdale upon the Durham side of the river.

4 *Vaccinium Vitis-idaea* L. Native. Montane. Area 9 8 7 5 4 3 2. Range 150-850. Frequent in heathery ground amongst the higher moorlands of both east and west, ascending from nearly the level of Boltby in Gurtogill to the peaks of Micklefell, Great Whernside and Lovely Seat.

1 *V. Oxycoccus* L. Native. Montane. Area 9 8 7 4 3. Range 0-700. Amongst the hills of both east and west in swamps in numerous localities. Cronkley fell, Nine Standards, Lovely Seat, Widdale fell, Coverdale moors, Penhill, Loosehoe moor, &c. In the Central Valley in Tanfield hall carr, and abundant in Leekby carr. In the Howardian tract in Ter-rington carr, and on Scakleton moor. Upon the plateaux of the eastern calcareous range over Hawnby, Seamer and Falsgrave.

5 *Pyrola rotundifolia* L. Native. Montane. Area 9 3. Range 50-150. In the Central Vale plentiful in Halnaby carr near Croft, where it was first noted by Mr. Woods. Upon the escarpment of the eastern calcareous hills near Hutton Bushel, *Bean!*

3 *P. media* Swartz. Native. Montane. Area 7 4 3 2. Range 0-150. In the Central Valley in fir woods at Breckenborough and on Hutton moor. Amongst the eastern hills in Mulgrave woods, and in a fir plantation below Cawthorne camps, *Anderson*; in Beckdale woods near Helmsley, *Phillips*; and near Hackness on the slope of Sawdon moor and Hutton Bushel moor, and in a wood at Whisperdales, *Bean!*

3 *P. minor* Swartz. Native. Montane. Area 9 8 7 5 4 3 2 1. Range 0-300. Frequent in fir woods, especially in the heathery hilly portions

of the Lower zone. In the Central Vale in woods between Sessay and Sowerby, and on Stockton forest.

3 *Pyrola secunda* L. Native. Montane. Area 9. Range 500. In Teesdale upon the perpendicular rocks at the White Force, the station almost or quite inaccessible. It grows also at Highcup Nick, beyond our limits.

5 *Monotropa Hypopitys* L. Native. Area 8. Range 100. Found in plenty by Mr. Hebblethwaite on the western edge of the Central Valley in a plantation of larches at Kirklington.

1 *Ilex Aquifolium* L. Native. Area general. Range 0-450. Common in woods, thickets and hedgerows, ascending to Holwick scars and the Main Limestone crags of Downholme moor, Preston moor and Copperthwaite moor. It forms almost alone a natural wood upon the slope towards the Esk of the spur of hill which separates Great Fryupdale from Little Fryupdale, and in a few other places.

2 *Ligustrum vulgare* L. Native. Subxerophilous. Area general. Range 0-150. Apparently indigenous in a few places in woods and thickets, as for instance upon the coast at Saltburn; but far more usually it grows in the hedgerows of the low country, and must be regarded as introduced. It is clearly wild amongst the Limestone scars and debris of Craven, but I have not seen it under similar circumstances within our limits. Grown in gardens up to 350 yards.

1 *Fraxinus excelsior* L. Native. Area general. Range 0-450. One of the commonest trees of the lowland hedgerows, but not so common as the Oak in the aboriginal dale woods. It ascends to Holwick scars and the limestone crags of the upper part of Hell gill.

*Vinca minor* L. Alien. Occasionally subspontaneous in the neighbourhood of parks and gardens. The most thoroughly established station which I have seen is at Moat wood near Thirsk, where it grows plentifully along with *Prunus avium* near the site of a nunnery.

*V. major* L. Alien. Like the preceding, but rarer. Melsonby, Camp-hill, Thormanby, Great Ayton, Guisbro', Runswick, &c.

7 *Gentiana verna* L. Native. Montane. Subxerophilous. Area 9. Range 400-800. (See page 101.) In Teesdale ascending to the Main Limestone of Micklefell, descending to the open space between Cronkley Scars and the river. It has been seen by the Tees side in the Central Valley at Blackwell bridge near Darlington, of course carried down by the river.

2 *G. Pneumonanthe* L. Native. Area 8 3 2 1. Range 0-100. Fre-



quent amongst the damp sandy heaths of the Central Vale and Howardian tract. Catton, Elmore, Pilmoor, Raskelf, Stockton, Strensall, Flaxton, Slingsby moor, Terrington carr, &c. Like the other ericetal plants of the low country, it is growing gradually less plentiful year by year, as cultivation and drainage extend.

1 *Gentiana Amarella* L. Native. Subxerophilous. Area general. Range 0-700. Frequent in grassy places, especially in the limestone tracts, ascending to the Main Limestone scars of Booze moor, and the limestone edges of the north-eastern slope of Micklefell.

1 *G. campestris* L. Native. Area 9 8 7 5 4 3 2 1. Range 0-600. Frequent in grassy places, ascending from the Coatham sandhills to the Main Limestone pavement of Camfell.

1 *Erythraea Centaurium* Pers. Native. Area general. Range 0-200. Frequent in dry or damp sandy ground in the low country, ascending in Wensleydale to Aysgarth.

2 *Chlora perfoliata* L. Native. Area 8 6 3 2. Range 0-100. In similar situations to the preceding, but rare. About the Magnesian Limestone on the north side of the Wharfe at Thorp Arch. In the Central Valley on Carthorpe moor, and in a sandy game-preserve between Thirsk and Woodend. Amongst the coast banks at Scalby.

*Villarsia nymphaeoides* Vent. Alien. Planted by Teesdale in the lake at Castle Howard, where it still grows. A native of the south-east of England.

1 *Menyanthes trifoliata* L. Native. Area general. Range 0-550. Frequent in ponds and swamps, especially amongst the hills, ascending to the plateau of Cronkley fell.

*Polemonium ceruleum* L. Alien. A common plant in cottage gardens, and an occasional straggler from garden cultivation. Cotherstone, Lartington, Marrick, Richmond, Howgrave, Arncliffe, &c. It is well established in tolerable plenty in the hedge which separates Pouter Carr from Baldersby Park. Indigenous in West Yorkshire amongst the limestone scars of Craven, and in the Westmoreland portion of Teesdale.

*Collomia grandiflora* Dougl. Alien. A native of North America, of which about fifty specimens were seen by Mr. W. Foggitt and myself in 1852 in a field of barley near the Norby gravel-pit, Thirsk. Mentioned by A. De Candolle as a species introduced into Germany.

2 *Convolvulus arvensis* L. Native. Area 8 7 6 5 4 3 2 1. Range 0-150. Common in cornfields and upon hedgebanks in the low country.

2 *C. sepium* L. Native. Area 9 8 6 5 4 3 2 1. Range 0-100. Common in hedges and by the side of streams in the low country.

2 *Convolvulus Soldanella* L. Native. Maritime. Area 5. Range C.L. Amongst the coast sandhills in front of the village of Coatham.

2 *Cuscuta europæa* L. Colonist. Area 2. Range 100. Plentiful in a forage field between Thirsk and Kirby Knowle, upon *Vicia sativa*, &c., 1861. It was first found there by Mr. W. Foggitt. Some of the plants were quite without scales in the throat of the calyx. This is the *var. nefrens* of Fries, which has been met with under similar circumstances in Scandinavia. The species is not usually a plant of cultivated land, and in this country commonly grows either upon Hop or Nettle. It is reported from Beningborough and Malton, but perhaps *C. Trifolii* may be what is intended.

2 *C. Epithymum* Murr. Native. Area 5 1. Range 0-100. Upon furze and heath, rare. In the Central Valley on Stockton forest near Thorpe's wood, *Flora*. In Cleveland near Teme bridge, *Mudd!* and by the foot road between Redcar and Kirkleatham, *Havlstone*.

2 *C. Trifolii* Bab. Colonist. Area 8 5 3 2. Range 0-250. Not very unfrequent upon Clover. Hutton Rudby, 1853; Carthorpe, 1854; West fields, Thirsk, plentiful behind Norby, Gormire, Carlton Miniott, &c., 1858. Found by Mr. Foxton in 1852, upon the Hambleton plateau near Morton house.

*C. Epilinum* Weih. Alien. Found by Mr. Wheldon in 1860 in a flax field at the Castle hills near Northallerton.

2 *Hyoscyamus niger* L. Native. Area 8 7 6 5 3 2. Range 0-100. Not unfrequent in waste ground in the low country, but without permanence in its stations.

2 *Solanum nigrum* L. Colonist. Area 8 6 2 1. Range 0-100. An occasional weed of cultivated ground. Catterick Bridge, Thirsk, Acomb, Stockton, &c.

2 *S. Dulcamara* L. Native. Area general. Range 0-200. Frequent in hedgerows and damp places in the low country, ascending to the lower part of Bishopdale. Cultivated up to 350 yards. At Keld at that elevation it grows luxuriantly to a height of 8 or 10 feet, and is trained round the porches of the houses.

*S. tuberosum* L. Commonly cultivated up to 400 yards, and grown casually up to 1600 feet.

*Datura Stramonium* L. Alien. Casually subsontaneous in waste ground. Richmond, 1835, *Ward*.

*Lycium barbarum* L. Frequently used for fences in the neighbourhood of the sea at Middlesbro', Coatham, Marske, &c. Cultivated in gardens up to 350 yards.

2 *Atropa Belladonna* L. Native. Subxerophilous. Area 9 8 7 4 3 2. Range 0-250. In the western dales at Cotherstone and West Burton. About the Magnesian Limestone at Pierce bridge, Snape and Gebdykes near Masham. In the dales of the tabular calcareous range of the east it is a plant of the aboriginal woods in several places. In Yowlasdale it is abundant, and it occurs also in Duncombe woods, on the slope of Fadmoor near Kirby-moorside, and near Scarbro' at Barrowcliff. Elsewhere in the east near a limekiln at Upsal, in Cleveland in Marske mill wood, and in the Howardian tract at Airyholme. I have no hesitation in considering it a Native in at any rate the dale stations.

2 *Verbascum Thapsus* L. Native. Area general. Range 0-200. Frequent upon dry banks, ascending in Yowlasdale to Cadale mill, and in Swaledale to Applegarth. Four other species of *Verbascum* have been met with, but apparently all of them only as stragglers from garden cultivation. *V. nigrum* was found by Mr. Ward near Middleton Tyas, in the lane which leads to Croft; *V. Lychnitis* by Mr. Ward on rubbish by the Swale side at Brompton; *V. virgatum* I have seen in a timber-yard at Thirsk, and it has been gathered also at Richmond, Kirklington and Northallerton; and *V. Blattaria* was found by Mr. Simpson near the Wensley suspension bridge, and is recorded by Archdeacon Peirson from a lane at Highthorn near Easingwold.

1 *Veronica arvensis* L. Native. Area general. Range 0-650. Common in cultivated fields and upon dry banks, ascending to the Main Limestone of Askrigg moor and Widdale fell. Usually, though not invariably, a plant of cultivated fields, and perhaps carried by sheep to both the stations mentioned. The higher localities of *Arenaria serpyllifolia* and some other species may not unlikely have originated in a similar manner. Amongst the higher hills the sheep often resort to the limestone banks for the sake of the grassy herbage which covers them.

5 *V. triphyllos* L. Native. Area 6. Range 50. Frequent in cultivated fields and on dry sandy banks in the sandy part of the Ainsty: Hob moor, Holdgate, Acomb, Nether Poppleton, &c. Only known in Britain in two other limited tracts of sandy ground.

1 *V. serpyllifolia* L. Native. Area general. Range 0-800. Common in grassy places, ascending to the Main Limestone of Micklefell.

1 *V. scutellata* L. Native. Area general. Range 0-750. Frequent in damp places, ascending to the springs which issue from the Main Limestone of Micklefell.

1 *V. Anagallis* L. Native. Area 9 8 7 6 5 3 2 1. Range 0-100. Frequent in watery places in the low country.

1 *Veronica Beccabunga* L. Native. Area general. Range 0-600. Common in watery places, ascending to the source of the Swale at Hollow mill cross, and the plateau of Cronkley fell.

1 *V. officinalis* L. Native. Area general. Range 0-800. Frequent upon dry banks, especially amongst the hills, ascending to the Main Limestone of Micklefell.

1 *V. montana* L. Native. Area general. Range 0-350. Frequent in the woods of the hilly tracts throughout the Lower zone, ascending to Shaw wood in Arkendale. Apart from the hills it grows in Coteliffe wood, and in the Central Vale by the Tees side near Stapleton.

1 *V. Chamædrys* L. Native. Area general. Range 0-800. Common in grassy and shaded places, ascending to the Main Limestone of Camfell, Widdale fell and Micklefell.

1 *V. hederifolia* L. Native. Area general. Range 0-300. Common in cultivated fields and upon dry banks throughout the Lower zone. It is usually an agrestal species.

1 *V. agrestis* L. Colonist. Area general. Range 0-250. Common in cultivated places, ascending in Wensleydale to fields above Aysgarth.

1 *V. polita* Fries. Colonist. Area 8 7 6 3 2 1. Range 0-150. Cultivated fields, much less frequent than the preceding. The *var. grandiflora* has been found by Mr. Wheldon near Northallerton.

2 *V. Buxbaumii* Ten. Colonist. Area 8 7 6 3 2 1. Range 0-300. Not unfrequent in cultivated fields. Whitcliffe, Richmond, Wath, Northallerton, Thirsk, Sandhutton, Knayton, Towthorpe, Haxby, Castle Howard, Malton, Scarbro', &c. I have gathered it at the foot of the great cliff at Whitstoncliff.

7 *Bartsia alpina* L. Native. Montane. Area 9. Range 300-600. In Teesdale upon the plateau of Cronkley fell, and by the streamside at Upper Cronkley and Winch bridge.

1 *B. Odontites* Huds. Native. Area general. Range 0-300. Common in cultivated fields and about roadsides throughout the Lower zone, ascending to Holwick, Bowes, Marske moor and Widdale.

1 *Euphrasia officinalis* L. Native. Area general. Range 0-700. Common in grassy and heathery places, ascending to the Main Limestone of Camfell and Widdale fell, and the peak of Lovely Seat. Our common form is authenticated by both Jordan and Boreau as their *E. ericetorum*. A plant which grows upon Stockton forest and Wass moor is *E. rigida* Jordan and Boreau! Both these range under *E. nemorosa* Host, the genuine segregate *officinalis* apparently not being a British plant at all.

1 *Rhinanthus Crista-galli* L. Native. Area general. Range 0-450. Common in grassy places, ascending to Upper Cronkley and Whitstondale scars.

7 *R. major* Angl. Native. Area 9 8 6 5 4 3 2 1. Range 0-200. Casually abundant in cornfields in the low country, and sometimes also in waste heathery places, but without permanence in its stations.

1 *Melampyrum pratense* L. including *M. montanum* Johnst. Native. Area 9 8 7 6 5 4 3 2. Range 0-800. Frequent upon heaths, and in heathery woods, ascending to the Main Limestone of Micklefell.

3 *M. sylvaticum* L. Native. Montane. Area 9. Range 250-300. In Teesdale by the wooded streamside about Winch bridge and below Holwick.

1 *Pedicularis palustris* L. Native. Area general. Range 0-500. Frequent in swamps and watery places from the carrs and heaths of the low country upwards amongst the hills, ascending to the plateau of Holwick fell.

1 *P. sylvatica* L. Native. Area general. Range 0-550. Frequent in damp grassy places and upon heaths, ascending to the bog at the source of the Swale at Hollow mill cross.

1 *Scrophularia nodosa* L. Native. Area general. Range 0-500. Common in woods and by streamsides, ascending in Wensleydale to Fossdale woods, and in Teesdale to White Force scars.

2 *S. Ehrharti* Stev. Native. Area 7. Range 200-250. In Wensleydale by the side of the road near the Woodhall toll bar, between Askrigg and Carperby.

2 *S. aquatica* L. Native. Area general. Range 0-100. Common in watery places in the low country, ascending to Sutton-under-Whitstoncliff.

2 *S. vernalis* L. Denizen. Area 8 2. Range 0-100. Plentiful along a steep hedgebank which runs between Cowling Hall and the village of Burrell, and by the side of the road between Catterick bridge and Scotch Corner. It has been met with also at Newburgh near Coxwold. At the Burrell station I have seen it, and though it is so near the village that the plant may well have been introduced, it is, at any rate, well-established.

1 *Digitalis purpurea* L. Native. Area 9 8 7 5 4 3 2 1. Range 0-550. Frequent upon sandy heaths and hedgebanks, especially amongst the hills, ascending to Cronkley and White Force scars.

*Antirrhinum majus* L. Alien. Occasionally subsontaneous on old walls, &c. Richmond castle, Jerveaux abbey, &c.

2 *A. Orontium* L. Colonist. Area 3. Range 0-100. Rare as a weed

of cultivated places. Helmsley, *Hinckes*. Bulmer, *Backhouse*. Malton, *Slater*!

*Linaria Cymbalaria* Mill. Alien. Not unfrequently subspontaneous on old walls. Reeth, Grinton, Richmond, Camphill, New Buildings, Coxwold, Stittenham, Whitby abbey, &c.

2 *L. spuria* Mill. Colonist. Area 3. Range 0-100. Very rare as a weed of cultivated fields, and not seen recently. Barton-le-street and Appleton-le-street, *Peirson*. Scarbro', *Williamson*. Perhaps would be better regarded as "Incognit."

2 *L. Elatine* Mill. Colonist. Area 6 3. Range 0-150. Like the preceding, a plant of cultivated fields, and very rare. It has been gathered by Mr. O. A. Moore near Thorp Arch, and by Mr. Ibbotson in one of the fields above Cawklees bank near Nunnington: and was reported also by the late Mr. Williamson from Scarbro'.

2 *L. repens* Aiton. Denizen. Area 4. Range 50. Gravelly ground near the river Esk at Ruswarp, *Mudd*! Also an occasional weed of cultivated ground.

1 *L. vulgaris* Mill. Native. Area 9 8 7 6 5 3 2 1. Range 0-200. Frequent upon dry banks and in cultivated fields in the low country, ascending in Wensleydale to Carperby. The *Peloria* form has been found by Mr. Ward near Richmond.

2 *L. minor* Desf. Colonist. Area 8 7 6 5 3 2. Range 0-200. Not unfrequent as a weed of cultivated ground in the low country. Leyburn, Harmby, Fingall, Bedale, Kirklington, Melmerby, Hutton Conyers, Bilton, Pickton, Langbargh, Lazenby, Northallerton, Rievaulx, Malton, Levisham, Hackness, &c.

5 *Limosella aquatica* L. Native. Area 8 3. Range 0-100. Watery places in the low country, rare. In the Central Valley on the banks of Bolton beck near Catterick bridge, *Ward*. In the Vale of Pickering in wet places at Kirby-moorside and Normanby bridge, *Peirson*.

*Mimulus luteus* Willd. Alien. An occasional straggler from garden cultivation. Rocks in the Hawes stream near the town, *Wheldon*! Kildale, *Mudd*! A native of North America.

2 *Orobanche major* Angl. Native. Area 3. Range 100. Parasitic upon the roots of furze, very rare. It has been gathered by Mr. Slater in the neighbourhood of Malton.

5 *O. elatior* Sutt. Native. Area 3. Range 100. Parasitic on *Centaurea Scabiosa*, very rare. It was found by Mr. Hebblethwaite in 1855 on the Limestone between Hildenley and Easthorpe, and has been noticed by various other botanists in the same neighbourhood.

5 *Orobancha minor* Sutt. Native. Area 8 7 2. Range 0-100. Parasitic principally upon Clover, occasionally plentiful in clover-fields in the low country. Burniston, Howe-upon-Swale, Nunwick, Northallerton, Thirsk, Sowerby, &c.

3 *O. rubra* Smith. Native. Xerophilous. Area 7. Range 250. I saw this species in 1861 at Leyburn Shawl, where it had been met with previously by Messrs. Ward and Pulleine. It grows upon Thyme, upon the surface of this Main Limestone scar, immediately beneath the debris of the flagstone quarries which yield *Teesdalia* and *Arenaria tenuifolia*.

2 *Lathræa squamaria* L. Native. Area 9 8 7 6 4 3 2 1. Range 0-250. Parasitic principally upon the roots of the Hazel, frequent, especially in the deep loamy soil of the aboriginal woods of the calcareous dales. It ascends to the lower part of Balderdale, and to Raydale woods in Seamerdale.

2 *Verbena officinalis* L. Native. Area 8 6 5 4 3 2 1. Range 0-150. Frequent about roadsides and in waste ground in the low country.

2 *Salvia verbenaca* L. Native. Xerophilous. Area 8 7 6 5 4 3. Range 0-150. In the west at Ellershaw near Wensley, and on the slope of the Richmond castle hill, about the Magnesian Limestone at Tanfield, and also near the Yore at Masham and Hutton Conyers. On the city walls at York. In Cleveland amongst the coast sandhills at Coatham and Saltburn, and about the East Row limekilns near Sandsend. Amongst the eastern calcareous hills in several places; Oswaldkirk, Hovingham, Snainton, and upon the castle hill at Scarbro'.

1 *Lycopus europæus* L. Native. Area 8 6 5 3 2 1. Range 0-100. Frequent in watery places in the low country.

2 *Mentha sylvestris* L. Native. Area 7 3 1. Range 0-200. Watery places, rare. In Wensleydale at West Burton, near the bridge called Hestome, Ward. In the Central Valley at Stillington, Flora. At Wass on the slope of the hill down as far as the high road to Coxwold, Ibbotson. *M. rotundifolia* is recorded by Robson from the coast sandhills near Saltburn, and has been found by Mr. W. Foggitt in a cultivated field near Thirsk.

2 *M. viridis* L. Denizen. Area 9 8 7 3 2 1. Range 0-200. Commonly cultivated in gardens up to 350 yards, and not unfrequent in ditches and by the side of streams in the low country. Barnard Castle, Ravensworth, Aysgarth, Wensley, Spennithorne, Nunwick, Mawnby, Sowerby, Woodend, Kilvington, Gate Helmsley, Strensall, Cotterfoss, Barton-le-street, Pickering, Hackness, &c.

2 *Mentha piperita* L. Native. Area 9 8 7 6 3 2 1. Range 0-250. Frequent in watery places in the low country, ascending in Wensleydale to Carperby, in Greta-dale to Brignall.

1 *M. aquatica* L. Native. Area general. Range 0-500. Common in watery places, ascending in Teesdale to the plateau of Holwick fell.

1 *M. sativa* L. including *rubra* and *gentilis*. Native. Area 9 8 7 5 4 3 2 1. Range 0-250. Frequent in watery places, ascending to Lonton and the Yore side below Hawes.

1 *M. arvensis* L. Colonist. Area general. Range 0-300. Common in cultivated fields throughout the Lower zone, ascending to the oat fields of the Hambleton plateau.

2 *M. Pulegium* L. Native. Area 6 3 1. Range 0-100. In several places in swamps amongst the heaths of the Central Vale and Howardian tract; Monckton, Haxby, Stockton, Strensall, Flaxton, Terrington. Reported also from Moorsholm in Cleveland.

1 *Thymus Serpyllum* L. Native. Area general. Range 0-800. Common upon dry banks, especially amongst the hills, ascending to the Main Limestone of Camfell, Widdale fell and Micklefell.

2 *T. Chamædrys* Fries. Native. Xerophilous. Area 3. Range 100-150. Upon the calcareous Howardian terrace in the quarry outside Kit-screw wood near Hovingham.

1 *Origanum vulgare* L. Native. Subxerophilous. Area 9 8 7 6 5 4 3 2. Range 0-450. Frequent in the woods and thickets of the limestone country upon both sides of the Central Valley, ascending to the Main Limestone scars of Harlen fell. Upon the Gritstone in Deepdale. In the Central Valley in dry sandy, or gravelly ground at Cleasby, Croft, Camp-hill, Burrell, Thirsk, by the Swale at Mawnby and by the Yore at Hutton Conyers. In Cleveland upon the Lias at Runswick Bay and in Mulgrave woods.

1 *Calamintha Acinos Clairv.* Native. Subxerophilous. Area 8 7 6 3 2. Range 0-100. About the Magnesian Limestone at Nosterfield and Thorp Arch. In the Central Valley in sandy ground at Kirklington, Thorpfield, Leckby and Carlton Miniott. In the Howardian tract frequent about Castle Howard.

2 *C. Nepeta Clairv.* Native. Xerophilous. Area 7 3. Range 0-100. Reported by Teesdale from the neighbourhood of Malton, and by Mr. Simpson from the Magnesian Limestone at Tanfield.

2 *C. officinalis* Angl. *C. ascendens* Jordan! Native. Xerophilous. Area 8 7 3 2 1. Range 0-200. In the west on the slopes of the Richmond



castle hill and about the Magnesian Limestone at Tanfield. Amongst the eastern calcareous hills at Rievaulx, Oswaldkirk, Byland woods, Hovingham, and on the walls of Scarbro' castle; also at Brandsby and Sutton-under-Whitstoncliff.

1 *Calamintha Clinopodium* Spenn. Native. Area general. Range 0-300. Frequent upon dry and shaded banks throughout the Lower zone.

1 *Teucrium Scorodonia* L. Native. Area general. Range 0-500. Frequent in thickets and rocky places, especially amongst the hills, ascending to Cronkley scars, and the Main Limestone cliffs of Booze moor and Copperthwaite moor.

5 *T. Scordium* L. Native. Area 8. Range 50. Found by Mr. Ward along with *Limosella* upon the banks of Bolton beck near its junction with the Swale.

1 *Ajuga reptans* L. Native. Area general. Range 0-500. Common in grassy places, both in the low country and amongst the hills, ascending to pastures above Raven's Seat, and the Main Limestone scars of Punchard's gill.

2 *Ballota nigra* L. Native. Area general. Range 0-150. Common upon hedgebanks in the low country, ascending to the walls of Richmond castle.

*Leonurus Cardiaca* L. Alien. Found by Mr. Brunton in a lane near Melmerby.

2 *Lamium Galeobdolon* Crantz. Native. Area 9 6 5 4 3. Range 0-150. In the west in the woods of Eglestone abbey and Thorp Arch. In the Ainsty in the lanes between Long Marston and both Tockwith and Askham Richard. In Cleveland in Cliff rig and Whitby woods. On the slope of the calcareous hills in Sleightholme dale, Kirkdale and near Pockley.

1 *L. album* L. Native. Area general. Range 0-250. Common upon hedgebanks and in waste places in the low country, ascending in Wensleydale to Bainbridge.

*L. maculatum* L. Alien. An occasional straggler from garden cultivation. Richmond, Kildale, &c.

1 *L. amplexicaule* L. Colonist. Area 8 7 6 5 4 3 2. Range 0-200. Not unfrequent in cultivated fields in the low country.

1 *L. purpureum* L. Native. Area general. Range 0-300. Common in cultivated fields and waste ground throughout the Lower zone, ascending to the Richmond race-course.

1 *L. incisum* Willd. Native. Area 8 7 6 5 3 2. Range 0-300. In similar situations, and with a similar vertical range to the preceding, but much less frequent.

2 *Galeopsis Ladanum* L. Colonist. Area 9 8 7 5 4 3 2. Range 0-250. Frequent in cultivated fields, ascending to the plateau of the Hambleton range near Scawton.

1 *G. Tetrahit* L. including *G. bifida* Boen. Colonist. Area general. Range 0-400. Common in cultivated fields and waste ground, ascending to Whitstondale woods, and in Arkendale to Shaw wood.

3 *G. versicolor* Curt. Colonist. Area 8 7 6 5 3 2 1. Range 0-200. Frequent in cultivated fields in the low country, ascending in Swaledale to Thorpe.

2 *Stachys Betonica* Benth. Native. Area general. Range 0-350. Frequent in grassy places throughout the Lower zone, ascending in Arkendale to Shaw wood. -

1 *S. palustris* L. Native. Area 9 8 6 5 4 3 2 1. Range 0-200. Frequent in cultivated fields and damp places in the low country. *S. ambigua* Sm. grows near a pond by the side of the high road about a mile south of Pierse bridge.

1 *S. sylvatica* L. Native. Area general. Range 0-400. Common in shaded places, ascending to the woods of Gunnerside gill and Fossdale.

*S. lanata* L. Alien. A casual straggler from garden cultivation. Calvas hall near Thirsk. This is the plant given in Suppl. Flo. Yorks. as *S. germanica*. It is a native of the South of Europe which is often grown in gardens.

1 *S. arvensis* L. Colonist. Area 8 7 6 5 4 3 2 1. Range 0-150. Frequent in cultivated fields in the low country.

1 *Glechoma hederacea* L. Native. Area general. Range 0-300. Common upon dry banks throughout the Lower zone, ascending to Applegarth scars and rocks at the foot of Whitstoncliff. *G. micranthum* Boen. with pink flowers has been met with upon a hedgebank at Carlton Miniott.

2 *Nepeta Cataria* L. Native. Area 8 6 4 3 2. Range 0-100. Not unfrequent upon hedgebanks in the low country.

2 *Marrubium vulgare* L. Native. Area 8 6 5 4 3 2. Range 0-100. Not unfrequent upon hedgebanks and by roadsides in the low country. Brompton-on-Swale, Leeming, Cundall, Dishforth, Carlton Miniott, Acomb, Newton (Cleveland), Saltburn, Thornton near Pickering.

1 *Prunella vulgaris* L. Native. Area general. Range 0-800. Common in grassy places, ascending to the Main Limestone of Micklefell.

1 *Scutellaria galericulata* L. Native. Area 9 8 6 5 4 3 2 1. Range 0-200. Frequent in watery places in the low country, ascending to Gormire and in Bilsdale to Chop Yate.

2 *Scutellaria minor* L. Native. Area 5 3. Range 0-150. About the Kildale fishponds, *Mudd*. Terrington Carr, *Teesdale*. Scarbro' mere, *Bean*.

1 *Myosotis palustris* With. Native. Area general. Range 0-200. Common in watery places in the low country, ascending to Gormire and the upper part of Newtondale.

1 *M. repens* Don. Native. Area 9 8 7 5 4 3. Range 0-750. Frequent in watery places, principally amongst the western hills, ascending to the springs which issue from the Main Limestone of Micklefell.

1 *M. cæspitosa* Schults. Native. Area general. Range 0-550. Common in damp places, ascending to the source of the Swale at Hollow mill cross, and the tarn on the slope of Micklefell towards Lunedale.

4 *M. alpestris* Schmid. Native. Montane. Area 9. Range 750-800. On the slope of the Main Limestone at the east end of the Micklefell ridge, where it was first found by the Backhouses in 1852.

2 *M. sylvatica* Ehrh. Native. Montane. Area general. Range 0-400. Common in the woods of the hilly tracts upon both sides of the Central valley, ascending to the Main Limestone scars of West Stonesdale moor.

1 *M. arvensis* Hoffm. Native. Area general. Range 0-500. Common in cultivated fields and upon hedgebanks, ascending to the Main Limestone scars of Harlen fell and Punchard's gill, the Hind rake lead mine and the tarn on the Lunedale slope of Micklefell. The variety *M. umbrata* Boreau! is frequent.

1 *M. versicolor* Lehm. Native. Area general. Range 0-300. Frequent upon dry banks throughout the Lower zone, ascending to the flagstone quarries of Leyburn moor.

1 *M. collina* Hoffm. Native. Area 8 7 5 4 2 1. Range 0-200. In similar situations to the preceding, but not so frequent, ascending to Kewick Nab.

1 *Lithospermum officinale* L. Native. Subxerophilous. Area 8 7 6 3 2. Range 0-200. In the dales of the west in thickets at Whitley mill, St. Trinian's, Easby abbey, Aysgarth force, and about the Magnesian Limestone at Tanfield and Thorp Arch. In the Central Valley at Kirklington, Carthorpe and Catton. Amongst the limestone hills of the east in Yowlasdale, Flazendale, at Oswaldkirk hag, Cawklees wood, Hildenley, and Wath, and upon the arenaceous Howardian terrace in Oxear's wood, and hedges at Welburn.

1 *L. arvense* L. Colonist. Area general. Range 0-300. Common in cultivated fields throughout the Lower zone, ascending to the oat fields of the Hambleton plateau over Hawnbly.

2 *Symphytum officinale* L. Native. Area 8 6 3 2 1. Range 0-100. Waste places and streamsides, not unfrequent in the low country; Richmond, Topcliffe, Dalton, Thirsk, Acomb, York, Malton, &c.

*Borago officinalis* L. Alien. An occasional straggler from garden cultivation. Richmond, Aisenby, Thirsk, York, Coatham, Whitby, Hovingham, Terrington, &c.

1 *Lycopsis arvensis* L. Colonist. Area 9 8 5 4 3 2 1. Range 0-150. Not unfrequent in cultivated fields in the sandy tracts of the low country.

*Anchusa sempervirens* L. Alien. An occasional straggler from garden cultivation. Spennithorne, Carlton House near Thirsk, &c.

2 *Cynoglossum officinale* L. Native. Area 9 8 7 5 4 3 2 1. Range 0-250. Frequent upon dry banks and by roadsides, ascending with *Atropa* to the aboriginal woods of the upper part of Yowlasdale.

*Pulmonaria officinalis* L. Alien. An occasional straggler from garden cultivation. Pierse bridge, Tanfield, Clifton, &c.

1 *Echium vulgare* L. Native. Area 8 7 6 5 4 3 2 1. Range 0-250. Frequent upon walls and dry banks, ascending in Wensleydale to Leyburn, and in Swaledale to Applegarth scars.

3 *Pinguicula vulgaris* L. Native. Area 9 8 7 5 4 3 2 1. Range 0-600. Frequent in swamps in the hilly tracts, ascending to the plateaux of Pin Seat and Cronkley fell. In the Central Valley in Ainderby carr, Kirklington carr, and amongst the heaths of the Foss district.

1 *Utricularia vulgaris* L. Native. Area 8 7 6 5 3. Range 0-100. Not unfrequent in ponds and slow streams in the low country. Tanfield, Nosterfield, Snape, Kirby Wiske, Poppleton, Askham bogs, Hob moor, South Stockton, Crambeck, Malton, Scarbro' mere, &c.

1 *U. minor* L. Native. Area 8 3 1. Range 0-100. Rare in swamps. Leckby carr, *Flora*. Stockton forest, *Moore*. Terrington carr, *Teesdale*.

1 *Primula vulgaris* *Huds.* Native. Area general. Range 0-550. Common in shaded and grassy places, ascending to the Main Limestone scars of Gunnerside gill, the limestone plateau of Keasdon, and in Widdale almost to the boundary of the Upper zone.

1 *P. veris* L. Native. Area general. Range 0-350. Common in grassy places throughout the Lower zone, ascending to the Hambleton plateau near Whitstoncliff. The hybrid Oxlip is not unfrequent in places where this and the preceding grow together, especially in the dales. I have a series of the same range of hybrids from both France and Switzerland, under the name of *P. variabilis* *Goupil*, and of hybrids also with the true *P. elatior* *Jacq.*

7 *Primula farinosa* L. Native. Montane. Area 9 8 7 5 3 2 1. Range 0-600. Frequent in swamps in the western dales, ascending to the plateau of Cronkley fell. A stemless or nearly stemless variety has been met with on Hawkswell moor near Bellerby, and near the station for *Polygala austriaca* in Teesdale. In the Central Valley and in the low country west of the eastern hills the species grows in several stations; Kirklington, Camp-hill, Newby Wiske, Dishforth, Woodend, Marderby, Stillington, and in Cleveland at Ingleby and Seamer. It is plentiful in Gurtof gill near Boltby, and in a field just where Flazendale opens out into the main dale of Rye. In this country, with the exception of two or three Lowland Scotch stations, it is confined to the English counties on the north of the Humber. With us it is often associated with *Lycopodium selaginoides*, *Blysmus compressus* and *Parnassia palustris*.

3 *Trientalis europæa* L. Native. Montane. Area 9 7 5 4 3 2. Range 150-600. Not unfrequent in heathery places amongst the higher hills on both sides of the Central Valley. It ascends to Cronkley fell and Holwick fell, and descends into the fir woods of the upper part of several of the dales of the east. It grows also upon the tabular limestone range above Hackness, and in the Howardian tract in Hovingham woods.

2 *Hottonia palustris* L. Native. Area general. Range 0-100. Frequent in ponds and ditches in the low country.

2 *Lysimachia vulgaris* L. Native. Area general. Range 0-250. Frequent in watery places in the low country, ascending to Aysgarth force and Seamer water.

7 *L. thyrsiflora* L. Native. Area 8 2. Range 0-150. Plentiful in a willowy carr about midway between Carlton Miniott and the Topcliffe railway station; also in Leckby carr in the great ditch, and a pond at the north-west edge of the swamp. It grows sparingly at the north-east corner of Gormire, and was found formerly where the York waterworks now are.

2 *L. Nummularia* L. Native. Area 8 6 4 3 2 1. Range 0-200. Not unfrequent in watery places in the low country. Bolton-on-Swale, Mawnby, Newby, Topcliffe, York, Askham. Holdgate, Knayton, Baysdale, Sheriff Hutton, Hovingham, Slingsby, Scarbro', &c.

1 *L. nemorum* L. Native. Area general. Range 0-600. Common in damp and shaded places, both in the low country and amongst the hills, ascending to the plateau of Holwick fell, and the springs which issue from beneath the Main Limestone scars of the Buttertubs Pass.

1 *Anagallis arvensis* L. Colonist. Area 8 7 6 5 4 3 2 1. Range 0-150.

Common in cultivated fields and waste ground in the low country. *A. carnea* has been met with at Brompton-on-Swale and Bilton; *A. cerulea* at Holdgate and Malton.

1 *Anagallis tenella* L. Native. Area 8 5 4 3 2 1. Range 0-250. Frequent in swamps throughout the Lower zone, ascending to the foot of Rolston scar.

2 *Centunculus minimus* L. Native. Area 3 1. Range 0-100. In a few places in damp ground upon Stockton forest and Strensall common.

2 *Samolus Valerandi* L. Native. Area 8 7 5 4 3 1. Range 0-100. Not unfrequent in watery places in the low country. Snape mires, Marton-le-moor, Kirby Wiske carr, South Stockton, Great Ayton, Wykeham carr, and amongst the sea-banks at Marske and Scarbro'.

1 *Glauz maritima* L. Native. Maritime. Area 5 4 3. Range C.L. Plentiful in the salt-marshes at Middlesbro' and Coatham. Banks of the Esk at Whitby and on the sands near Filey.

1 *Armeria maritima* Angl. Native. Submaritime. Area 7 5 4. Range C.L. and 200-250. In Wensleydale plentiful at the Woodhall lead mines, and on the banks of the stream down to the Yore. Along the coast-line in Middlesbro' and Coatham marshes, and about the Esk at Whitby.

2 *Statice Limonium* L. Native. Maritime. Area 5 4. Range C.L. Along the coast line in Middlesbro' and Coatham marshes and about the Esk at Whitby.

2 *S. Bahusiensis* Fries. Native. Maritime. Area 5. Range C.L. Amongst the Coatham salt-marshes, *Simpson!*

1 *Plantago major* L. Native. Area general. Range 0-550. Common along roadsides and in grassy places, ascending in Swaledale to Hollow mill cross, and in Wensleydale to the Main Limestone of Askrigg moor.

2 *P. media* L. Native. Area general. Range 0-350. Frequent in grassy places throughout the Lower zone, ascending to the Hambleton plateau over Bolthby.

1 *P. lanceolata* L. Native. Area general. Range 0-700. Common in grassy places and cultivated fields, ascending in Teesdale to the slope of Mickelfell towards the Cronkley plateau, in Swaledale to the peak of Booze moor, in Wensleydale to the Main Limestone of Camfell. I have met with *P. Timbali Jordan* in cultivated fields at South Kilvington.

1 *P. maritima* L. Native. Submaritime. Area 9 7 5 4 3. Range C.L. and 300-600. In Teesdale upon the sugar-limestone of Cronkley fell, and by the streamside about the High force and Winch bridge. It

has been noted in several places lower down, but probably the stations are not permanent. In Seamerdale near Carr end. Along the coast line from Middlesbro' to Filey it is perhaps the most plentiful of all our characteristically Maritime species, growing both upon the cliffs and in low marshy ground.

1 *Plantago Coronopus* L. Native. Submaritime. Area 5 4 3. Range 0-200. Frequent in sandy ground along the coast from Middlesbro' to Scarbro'. Inland it grows upon Coulton moor and Yearsley moor in dry sandy ground.

1 *Littorella lacustris* L. Native. Area 9 8 7 3 2 1. Range 0-400. Not unfrequent in ponds in the sandy heathery tracts. Upper Cronkley, Bellerby moor, Hutton moor, Suett carr, Yearsley moor, Gormire, Terrington carr, Foss reservoirs, Stockton forest, Strensall common, Scarbro' mere, &c.

SUMMARY. Incognits and segregates excluded, 319 species come under this chapter, 42 of which are Aliens, 9 Denizens, 37 Colonists, and 231 Natives: of the three latter grades of citizenship 267 are plants of the Lower, 109 of the Middle, and 33 of the Upper zone; and they range under the types of distribution as follows, viz.; British 137, English 93, Scottish 13, Highland 11, Germanic 13, Intermediate 9.

## CHAPTER XVIII.

### MONOCHLAMYDEÆ AND GYMnosPERMEÆ.

*Amaranthus Blitum* L. Alien. Found by Mr. Hebblethwaite in 1858, in waste ground at Camphill.

5 *Chenopodium olidum* Curt. Colonist. Area 6 1. Range 0-100. Rare in waste ground. At York about the foot of the city walls and in garden ground at Bootham.

2 *C. polyspermum* L. Colonist. Area 8 1. Range 0-100. Rare in waste ground. Beningborough, Backhouse. Camphill, Hebblethwaite!

5 *C. urbicum* L. Colonist. Area 8 6 5 1. Range 0-100. Rare in waste ground. Camphill, Newby Wiske, South Otterington, York, Cargfleet, Redcar.

2 *C. rubrum* L. Native. Area 9 8 6 5 3 2 1. Range 0-150. Not unfrequent in waste ground in the low country. Apparently a true Native in the coast salt-marshes. The other species, *C. Bonus-Henricus* alone excepted, appear to range best amongst the Colonists.

2 *C. murale* L. Colonist. Area 6 1. Range 0-100. Waste ground at York at the foot of the city walls, and elsewhere upon both sides of the Ouse.

1 *C. album* L. Colonist. Area general. Range 0-300. Common in cultivated ground throughout the Lower zone. *C. paganum* Reich. is frequent in rich soil. *C. ficifolium* as a plant of North Yorkshire is doubtful.

*C. Botrys* L. Alien. A weed in cultivated ground at Camphill and Great Ayton. From the former station I have distributed numerous garden-grown specimens, raised from the seed of the subsontaneous plant by Mr. Hebblethwaite.

1 *C. Bonus-Henricus* L. Denizen. Area general. Range 0-400. Frequent in waste ground, but always in the neighbourhood of villages



and farmhouses. Like the Sycamore, probably an introduction of very ancient date. It ascends in the Yore district to the village of Cotterdale and in Gretaedale to Sleightholme.

5 *Chenopodium glaucum* L. Colonist. Area 2. Range 0-100. Waste ground at Norby near Thirsk, where I have seen it with *Atriplex deltoidea* for many consecutive years. Rubbish heap near Sandhutton.

2 *Atriplex portulacoides* L. Native. Maritime. Area 5. Range C.L. Amongst the salt-marshes at Coatham and about the mouth of the Tees.

8 *A. arenaria* Woods. Native. Maritime. Area 5 3. Range C.L. Amongst the salt-marshes at Coatham and on the north sands at Scarbro'.

1 *A. Babingtonii* Woods. Native. Maritime. Area 5 4. Range C.L. Amongst the salt-marshes at Middlesbro' and Coatham, and in waste ground at Saltburn, Sandsend and Whitby.

1 *A. patula* E. B. Native. Area general. Range 0-400. Common in cultivated fields and waste ground, ascending as high as field cultivation reaches.

1 *A. deltoidea* Bab. Native. Area 6 5 4 2 1. Range 0-100. Not unfrequent in waste ground upon the sea coast, and inland in rich soil in the low country. Thirsk, York, Middlesbro', Coatham, Redcar, Whitby, &c.

1 *A. angustifolia* Smith. Native. Area 9 8 6 5 4 3 2 1. Range 0-300. Frequent in cultivated fields and waste ground throughout the Lower zone, ascending to the plateau of the Hambleton range over Hawnby. These three species, like *Pyrethrum inodorum*, *Viola tricolor*, *Veronica hederifolia* and several others, occupy an intermediate position between the Colonists and the typical Natives.

1 *A. littoralis* L. including *marina* L. Native. Maritime. Area 5 4 3. Range C.L. Plentiful in the marshes at Middlesbro' and Coatham. On the north sands at Scarbro'. Subspontaneous inland on the railway embankment at Guisbro'.

1 *Beta maritima* L. Native. Maritime. Area 5 3. Range C.L. Frequent amongst the marshes at Middlesbro' and Coatham, and plentiful on the Castle hill at Scarbro'.

1 *Salsola Kali* L. Native. Maritime. Area 5 4 3. Range C.L. Frequent along the coast-line in sandy ground from Middlesbro' to Filey.

1 *Schoberia maritima* Meyer. Native. Maritime. Area 5 3. Range C.L. Frequent amongst the salt-marshes about Middlesbro' and Coatham. On the north sands at Scarbro'.

1 *Salicornia herbacea* L. Native. Maritime. Area 5 4. Range C.L.

Frequent amongst the salt-marshes about Middlesbro' and Coatham, and about the mouth of the Esk at Whitby.

5 *Salicornia radicans* Smith. Native. Maritime. Area 5. Range C. L. Muddy banks of some of the salt-water ditches in Coatham marshes, *Mudd!*

1 *Polygonum Bistorta* L. Native. Area 9 8 7 6 4 3 2 1. Range 0-300. Not unfrequent in grassy places throughout the Lower zone, ascending in Teesdale to Winch bridge.

4 *P. viviparum* L. Native. Montane. Area 9 7. Range 200-450. Fields about the Tees from Upper Cronkley down the river to Middleton and Lonton. In the Yore district about Seamer water, Aysgarth force and other places in the upper part of the dale.

1 *P. amphibium* L. Native. Area general. Range 0-250. Frequent in ponds and damp places in the Lower zone, ascending in Wensleydale to the neighbourhood of Hawes.

1 *P. lapathifolium* L. including *nodosum* and *laxum*. Native. Area general. Range 300. Frequent in cultivated fields and damp places throughout the Lower zone, ascending to the oat-fields of the Hambleton plateau over Hawaby. *P. laxum* has been met with at South Otterington and between Thirsk and Woodend.

1 *P. Persicaria* L. Native. Area general. Range 0-350. Frequent in similar situations to the preceding, ascending as high as field cultivation reaches.

5 *P. mite* Schrank. Native. Area 6 2 1. Range 0-100. Watery places in the low country, rare. Banks of the Foss near York, and of the great ditch on Knavesmire. Banks of the Wiske at Newsham and ditches near Sandhutton.

1 *P. Hydropiper* L. Native. Area general. Range 0-250. Frequent in watery places in the low country, ascending to the upper part of Coverdale.

2 *P. minus* Huds. Native. Area 8 6 2 1. Range 0-100. Watery places in the low country, rare. Bolton-on-Swale, banks of the Wiske at Yafforth and Kirby, and with *P. mite* in the neighbourhood of York.

1 *P. aviculare* L. Native. Area general. Range 0-400. Common in cultivated fields and about roadsides, ascending to the Shaw Paddock Inn, and coalpits at the foot of Dodfell. *P. agrestinum* Jordan is frequent in rich soil.

1 *P. Convolvulus* L. Colonist. Area general. Range 0-300. Common in cultivated fields throughout the Lower zone.

*Polygonum Fagopyrum* L. Alien. Casually subspontaneous in waste ground. Bedale, Seamerdale, &c.

2 *Rumex Hydrolapathum* L. Native. Area 8 7 6 5 3 2 1. Range 0-100. Not unfrequent in ditches and swamps in the low country. Carthorpe, Nunwick, Askham Bogs, Newby Wiske carr, Newsham carr, Crathorn, about the Foss at Huntington and the Derwent at Crambeck.

1 *R. crispus* L. Native. Area general. Range 0-400. Common along roadsides and in damp places, ascending to Aysgill above Hawes, and Upper Cronkley.

3 *R. aquaticus* L. Native. Montane. Area 9 8 7 6 2 1. Range 0-400. Frequent in all the three western dales by roadsides and in damp places. It ascends to Upper Cronkley and descends with the streams into the Central Valley. It has been noted in several stations about the Swale and the Ouse in the low country, as far down as York.

2 *R. pratensis* M. & K. Native. Area 8 1. Range 0-100. In a ditch below Easby, Ward: and about the Foss at Heworth and Earsley bridge, Moore.

1 *R. obtusifolius* Angl. Native. Area general. Range 0-500. Common in damp places and waste ground, ascending in Teesdale to Upper Cronkley, in Swaledale to Raven's Seat and Crook Seat.

1 *R. sanguineus* L. Native. Area general. Range 0-400. Frequent in similar situations to the preceding, ascending in Wensleydale to Hawes, in Swaledale to the Main Limestone scars of West Stonesdale moor.

1 *R. conglomeratus* Murr. Native. Area general. Range 0-300. Frequent in similar situations to the preceding throughout the Lower zone.

2 *R. maritimus* L. Native. Area 8 3. Range 0-100. Beside a pond at Bury hills near Kirklington, Simpson! Scarbro' mere, abundant in 1858, now rare, Bean!

2 *R. palustris* Smith. Native. Area 8 6 1. Range 0-100. In a ditch at Pickhill, Simpson! On Knavesmire, Backhouse; and about the Foss near Peaseholme-green bridge, Moore.

1 *R. Acetosa* L. Native. Area general. Range 0-850. Everywhere common in grassy places, ascending to the peaks of Lovely Seat and Mickelfell, and to the Main Limestone of Camfell.

1 *R. Acetosella* L. Native. Area general. Range 0-850. Common in sandy ground, both upon heaths and elsewhere, ascending to the peaks of Lovely Seat and Mickelfell.

*Oxyria reniformis* Hook. Incognit. Mentioned by Teesdale as a plant of North Yorkshire, but unknown as such to me.

5 *Hippophae rhamnoides* L. Native. Maritime. Area 4. Range C.L. There is a small thicket of the Sea Buckthorn upon the sea bank a short distance to the north of the village of Uppgang near Whitby, a station recorded by Ray. I saw the plant there and gathered specimens in flower in the spring of the present year (1862).

2 *Daphne Laureola* L. Native. Area 8 7 6 5 4 3 2. Range 0-150. Not unfrequent in hedges and woods in the low country. Richmond, Tanfield, Thorp Arch, Newby Wiske, Northallerton, Thornton-le-street, Sessay, Newton in Cleveland, Yearby, Whitby, Coxwold, Wassa, Rievaulx, Castle Howard, Scarbro', &c.

2 *D. Menziesii* L. Denizen. Area 8 7. Range 0-200. Occasionally as if spontaneous in some of the woods of the low country, but never in large quantity. Clink bank, hedge at St. Trinian's, in an island in the Swale below the Foss, two bushes have been seen by the Swale side opposite Brompton, and one at Aisenby. Found by Mr. Puleine in the west wood near Bolton Hall, and it has also been seen by the Yore side at Aysgarth force, and is reported from a wood near Northallerton. Cultivated in gardens up to 350 yards.

*Asarum europæum* L. Alien. Subspontaneous in a wood near the hall at Newby Wiske. Probably a garden escape, but now well established.

*Aristolochia Clematitis* L. Alien. Subspontaneous or planted near the old castle in Mulgrave woods, *Mudd!* and about Wykeham abbey, *Bean*.

3 *Empetrum nigrum* L. Native. Montane. Area 9 8 7 5 4 3 2 1. Range 0-850. Common amongst the hills upon both sides of the Central Valley, ascending to the peaks of Dodfell and Micklefell. At Saltwick Ness near Whitby I have seen it almost within reach of the tide. It is a plant of the heaths of the Howardian tract, but I am not aware that it occurs amongst those of the Central Valley.

1 *Euphorbia helioscopia* L. Colonist. Area general. Range 0-300. Common in cultivated fields throughout the Lower zone, ascending to the Hambleton plateau over Hawnby.

2 *E. platyphylla* L. Colonist. Area 1. Range 0-100. Cultivated fields at Rawcliffe, *Moore*: and Haxby, *Spruce*.

*E. hiberna* L. Alien. Subspontaneous or planted in Kildale woods, *Mudd!*

*E. Cyparissias* L. Alien. Casually subspontaneous in waste ground. Snape mires, *Simpson!* Cliff rig near Ayton, *Mudd!*

2 *E. exigua* L. Colonist. Area general. Range 0-250. Frequent in cultivated fields in the Lower zone.

1 *Euphorbia Peplus* L. Colonist. Area general. Range 0-350. Common in cultivated fields, ascending as high as field cultivation reaches.

*E. Lathyris* L. Alien. Casually subspontaneous on waste ground. Hudswell, Kirklington, Newton-le-Willows, Newton in Cleveland, &c.

2 *E. amygdaloides* L. Native. Area 6. Range 50. In the Ainsty in a copse between Bilton and Wighill Park, Moore.

*Buxus sempervirens* L. Alien. Cultivated in gardens up to 350 yards, and occasionally to be met with in a subspontaneous state.

1 *Mercurialis perennis* L. Native. Area general. Range 0-500. Common in shaded places, ascending to Cronkley scars and the Main Limestone cliffs of Harlen fell.

1 *Urtica urens* L. Native. Area general. Range 0-350. Frequent by roadsides and in waste ground throughout the Lower zone, ascending in Swaledale to Keld.

1 *U. dioica* L. Native. Area general. Range 0-800. Everywhere common in waste ground, ascending to the Main Limestone of Widdale fell and Micklefell.

1 *Parietaria diffusa* Koch. Native. Area 8 7 6 4 3 2 1. Range 0-250. Frequent upon old walls, ascending in Wensleydale to Bolton scars. I have seen the species within our limits once only upon a natural cliff, a limestone scar in Billybank wood near Richmond.

2 *Humulus Lupulus* L. Denizen. Area general. Range 0-200. Frequent in hedgerows in the low country, but I have not seen it except in the vicinity of houses, and never in the aboriginal woods. The heat of the summers of the low country is usually not intense enough to properly ripen its seeds.

1 *Ulmus montana* Smith. Native. Area general. Range 0-450. Common in hedgerows and woods, ascending in Teesdale to Holwick scars, in Swaledale to the Main Limestone cliffs of Whitstondale and Punchard's gill, in Wensleydale to Upper Whitfell force. Unquestionably native, and frequent both in the lowland hedgerows and the aboriginal dale woods.

2 *U. suberosa* Ehrh. Denizen. Area general. Range 0-350. Frequent in the hedgerows and plantations of the low country, but I have never seen the species amongst the limestone scars or elsewhere in an unquestionably aboriginal state. It is comparatively rare in the dales, but I have seen it as high as the elevation mentioned.

1 *Quercus Robur* L. Native. Area general. Range 0-400. Common in the lowland hedgerows, and perhaps the commonest tree of the aboriginal woods of the east, both in the calcareous and arenaceous dales. In

the west, though plentiful in the woods of the low gritstone tracts, upon the high calcareous scars, where grow Ash, Wych Elm, Hazel, Aspen, Rowan, Birch, Hawthorn, and some of the Roses and Willows, and in the upper part of the western dales it is scarcely to be seen. It was the only indigenous deciduous-leaved forest tree that suffered notably from the severe weather of the Christmas of 1860. I think that I have seen it at 500 yards in Teesdale, but if so I have neglected to make a note at the time. With us *Q. pedunculata* is much more frequent both in the dales and low country than *Q. sessiliflora*, but this latter is pretty generally distributed.

2 *Fagus sylvatica* L. Denizen. Area general. Range 0-400. The Beech is said to be a tree of the post-glacial peat swamps, upon which ground I have placed it as "Denizen." At the present day it is planted up to 400 yards amongst the hills, and, unlike the Oak, is not unfrequent in the upper part of the western dales. But although such is the case I have not, after careful search, been able to meet with it either amongst the calcareous scars of the western hills or in the aboriginal woods of the eastern dales. Judging from present appearances solely, I should say that the Beech is less likely to be indigenous with us than the Sycamore.

*Castanea vulgaris* Lam. and *Carpinus Betulus* L. are both to be met with not unfrequently in hedgerows and plantations, but have no claim to be regarded as indigenous. I have seen the former in Arkendale clearly within the bounds of the Middle zone, but even in the low country the fruit only just grows so as to be eatable.

1 *Corylus Avellana* L. Native. Area general. Range 0-550. The commonest bush of the aboriginal dale woods, especially in the calcareous dales of both the eastern and western hills. Frequent in the low country, but not so common in the hedgerows as the Hawthorn. It ascends to the upper part of Cronkley scars and the Main Limestone cliffs of Punchard's gill.

1 *Alnus glutinosa* L. Native. Area general. Range 0-350. Common in damp woods and along the banks of streams, ascending in Teesdale to Holwick, in Swaledale to Shaw wood near Langthwaite, and in the Yore district to the lower part of Fossdale.

1 *Betula alba* L. including *glutinosa* Fries. Native. Area general. Range 0-550. Common in woods and hedgerows throughout the Agrarian region, especially amongst the arenaceous hills, where the Rowan is its frequent associate. The glen of Maze beck and that of the northern fork of the Swale are both called Birkdale.

2 *Populus alba* L. with *P. canescens* Smith. Denizen. Area general. Range 0-200. The two species are both not unfrequent in hedgerows and along stream-sides in the low country. Winch regards *P. alba* as indigenous in the Tyne province, but I have not seen either of them within our limits in a clearly indigenous situation.

1 *P. tremula* L. Native. Area 9 8 6 5 4 3 2 1. Range 0-550. Frequent in woods and hedgerows, ascending to Cronkley and Holwick scars. Doubtless it is an inhabitant of the Yore district, but I have no note of its occurrence.

2 *P. nigra* L. Denizen. Area general. Range 0-300. Frequent in hedgerows and by stream-sides throughout the Lower zone, but quite doubtful as an indigenous tree. *P. dilatata* is not unfrequently planted in the low country. *P. monilifera* occurs in plantations up to 350 yards, and succeeds better than almost any other tree in exposed situations along our sea coast.

3 *Salix pentandra* L. Native. Area general. Range 0-350. Frequent along stream-sides and in hedgerows and damp woods throughout the Lower zone, ascending to the lower part of Whitstondale.

1 *S. fragilis* L.\* including *decipiens* Hoffm. and *Russelliana* Smith. Native. Area general. Range 0-250. Common by stream-sides and damp woods in the Lower zone, ascending to the fishpond upon Lartington moor.

1 *S. alba* L. Native. Area general. Range 0-200. Common in similar situations to the preceding, with which it is often associated. Both are commonly planted throughout the Lower zone. *S. carulea* and *S. vitellina* both occasionally occur.

2 *S. triandra* L. Native. Area 9 8 7 6 5 3 2 1. Range 0-150. Frequent by stream-sides in the low country, and often planted in osier grounds. *S. undulata*, which is indigenous in West Yorkshire, I have met with sparingly in an osier ground in the neighbourhood of Thirsk.

8 *S. acutifolia* Willd. Denizen. Area 7 5. Range 0-200. Found by Mr. Ward in 1831 at Broadhams near Wensley, a single bush only, which is now eradicated. More recently it has been met with by Mr. Mudd in Airyholme wood, and in two or three places by the Leven side near Great Ayton, but only in very small quantity in each station.

1 *S. purpurea* L. including *Helix*. Native. Area 9 8 7 6 5 3 2.

\* A large number of Willows from the neighbourhood of Richmond and from Wensleydale were contributed by Mr. Ward to Leefe's *Salicetum Britannicum*. A series of notes by Dr. Anderssen, the monographer of the Swedish Willows, respecting these specimens and others contained in the fasciculus are given in the Botanical Gazette, vol. 3, page 67.

Range 0-250. Common by the streamsides in the western dales, and occurring also more sparingly about the streams and damp woods in various parts of the low country. It ascends in Teesdale to Holwick, in Wensleydale to Hawes, and is sometimes planted in osieries.

2 *Salix rubra* Huds. Native. Area 9 8 7 5 2. Range 0-100. Banks of Barton beck near Croft, of the Tees at Yarm, of the Swale at Richmond and in many places lower down, of the Yore at Tanfield, and of Codbeck at Thirsk; also in Carlton carr, and sometimes planted in osieries.

1 *S. viminalis* L. Native. Area general. Range 0-250. One of the commonest species of the streamsides of the low country, but less frequent in the western dales than *S. purpurea* and *S. phylicifolia*. Commonly planted in osieries. Grown in gardens up to 350 yards.

2 *S. Smithiana* Willd. Native. Area general. Range 0-300. Common throughout the Lower zone about streamsides and in hedgerows and damp woods, ascending to the lower part of Widdale. *S. ferruginea* and *S. rugosa* are both frequent, but the genuine *S. acuminata* (*S. dasyclados* Wimmer) I have not seen from within our limits. Dr. Anderssen suggests that the plant from the neighbourhood of Richmond given in Leefe's *Salictum* as No. 39, is *S. Seringeana* Gaud.

1 *S. cinerea* L. Native. Area general. Range 0-450. Common by streamsides, and in hedgerows and damp woods, ascending to the falls of the Cover at the foot of Great Whernside, and the Main Limestone scars of Punchard's gill. No. 43 of the *Salictum*, of which there is a single tree near the bridge over the Swale at Applegarth, is not unlikely a hybrid between this and *S. phylicifolia*. Dr. Anderssen referred it to *S. laurina*.

1 *S. aurita* L. Native. Area general. Range 0-550. Frequent in damp thickets, especially amongst the hills, ascending to Cronkley scars.

1 *S. Caprea* L. Native. Area general. Range 0-550. Common in woods and hedgerows, ascending in Teesdale to Cronkley and White force scars, in Arkendale to the Main Limestone cliffs of Punchard's gill.

3 *S. nigricans* Fries. Native. Montane. Area 9 8 7 3 2. Range 0-400. Not so frequent about the streamsides in the western dales as *S. phylicifolia*. In Gretadale near Rutherford bridge. In Swaledale about Richmond in several places. In the Yore district in Fossdale woods, and at Gale force and in Hardraw gill. Amongst the eastern hills in Bilsdale, Flazendale, Beckdale and Cockerdale. The common form of North Yorkshire is *S. Andersoniana* Smith. *S. hirta* S. B. 37 is from a marshy field near Ravensworth. The plants given in the *Salictum* as *rupestris* Dr. Anderssen places under *S. phylicifolia*.



3 *S. phlyicifolia* L. Native. Montane. Area 9 8 7. Range 50-550. Common upon the banks of the streams in the western dales. It ascends in Teesdale to the falls of Maze beek, in Swaledale to Raven's Seat, and in the Yore district to Hell gill and the falls of the Cover at the foot of Great Whernside. This includes plants referred by Messrs. Ward and Leeke to *laurina*, *propinqua*, *tenuior*, *tenuifolia*, *Davalliana*, *Weigeliana*, *nitens*, *Croweana*, *laxiflora* and *tetrapla*. Though much more common than *S. nigricans* in the west this has not been found at all amongst the eastern hills.

1 *S. repens* L. Native. Area general. Range 0-550. Common in heathery ground, ascending to Cronkley scars. *S. rosmarinifolia* has been reported from Seamer Water and Saltergate, probably in error for this species. *S. herbacea* is mentioned as a North Yorkshire plant by Teesdale, but is not known to me as such.

1 *Myrica Gale* L. Native. Area 6 4 3. Range 0-200. Plentiful in Askham bogs and in the Vale of Pickering in swampy fir woods one mile south-west of Ayton. It occurs also in several of the dales of the eastern arenaceous hills: in Eskdale south of Castleton, and plentiful in Goathland dale, Newtondale (Fen bog), and Harwood dale. In the Scotch Highlands it ascends to an elevation of 560 yards, but it is not known to me as a plant of our western hills, and in the east its known stations are all clearly within the Lower zone.

3 *Pinus sylvestris* L. Denizen. Area general. Range 0-450. This is a tree of the post-glacial peat swamps, and at the present day is frequent both in the low country and amongst the hills. Entire woods of it are not unfrequent, as between Gilling and Helmsley, and a clump or row of trees may often be seen upon the north and east of houses in exposed situations. Whether any of the trees now in existence are the descendants of the aboriginal possessors of the soil may be doubted, and it is quite impossible to decide confidently. *Larix europæa* is still more frequent than the *Pinus*, and forms extensive plantations in the dales and in exposed sterile tracts both in the low country and amongst the hills where no other tree succeeds. *Abies excelsa* is frequent in plantations both in the low country and amongst the hills, and will prosper in damper situations than suit the two preceding, but is not so hardy: and *Abies pectinata*, though not nearly upon a par as regards frequency with the other three is occasionally to be seen. There is a considerable quantity of it in Deepdale woods. Taken together, these planted Coniferæ are doubtless as plentiful at the present day in North Yorkshire as a whole as all the other trees taken

together, and in many districts they give to the scenery its predominant tone.

1 *Juniperus communis* L. Native. Subxerophilous. Area 9 8 5 4 3. Range 0-600. This and the Rowan have the widest vertical range of all the trees, and though far from frequent, the Juniper seems to be usually of indigenous growth where it does occur. In Teesdale it ascends to the plateau of Cronkley fell, and is plentiful about the river at the High force and lower down. In the West Swale district it grows upon the limestone scars in several places, and ascends to the Main Limestone of Gunnerside gill, Punchard's gill and Booze moor. Elsewhere it grows only in small quantity. It is to be met with at Staniston hill near Burniston, about the head of the Leven and on the moors above Guisbro' and Battersby, and also in Snailesworth and Danbydale. Contrary to the Furze and Broom, the Juniper and Yew are with us par excellence bushes of the Mountain Limestone tract, the former being more especially prominent in Teesdale, the latter in Swaledale.

2 *Taxus baccata* L. Native. Xerophilous. Area 9 8. Range 100-450. Clearly indigenous upon the scars of the western hills. In Swaledale it ascends to the Main Limestone scars of West Stonesdale moor and Copperthwaite moor, and is plentiful in the woods of the lower part of the dale. It is also to be met with upon the cliffs in Teesdale, Gretadale and Deepdale, and may be indigenous in the east in Wass woods and Hovingham woods, and in some other places. It is one of the frequent trees of the post-glacial peat swamps, but is uncommon now, even as planted.

SUMMARY. In this chapter 99 species are enumerated, 15 of which are Aliens, 9 Denizens, 11 Colonists, and 64 Natives. Of species of the three latter categories of citizenship 83 are plants of the Lower, 30 of the Middle, and 5 of the Upper zone, and they range under the types of distribution as follows, viz.; British 46, English 23, Scottish 6, Highland 1, Germanic 6, Local 2.

## CHAPTER XIX.

### FLORIDEE.

2 *Spiranthes autumnalis* Rich. Native. Subxerophilous. Area 8 3. Range 0-200. In the Central Valley abundant in grassy places in the neighbourhood of Carthorpe and Camphill. Upon the Middle Oolite in Duncombe park and in Forge woods near Scarbro'. Upon the arenaceous Howardian terrace at Ganthorp and near the sandstone quarry in Castle Howard Park.

1 *Neottia Nidus-avis* Rich. Native. Area 8 7 6 5 4 3. Range 0-200. Not unfrequent in shaded woods, principally in the lower part of the dales. Round Howe, Easby woods, Bolton woods, Heaning, Masham, Thorp Arch, Kirklington, Crathorn, Egton bridge, Mulgrave woods, Beckdale, Hildenley, Coneysthorp, Wrelton, Thornton, Yedmandale, &c.

3 *Listera cordata* R. Br. Native. Montane. Area 9 8 7 5 4 3 2 1. Range 0-600. Frequent in heathery ground from the Central Valley (Stockton forest, Halnaby Carr,) upwards to the plateau of Cronkley fell.

1 *L. ovata* R. Br. Native. Area general. Range 0-450. Frequent in shaded and grassy places, ascending in Teesdale to Upper Cronkley, in Swaledale to the Main Limestone scars of Keasdon.

1 *Epipactis latifolia* All. Native. Area general. Range 0-250. Frequent in woods in the low country and the lower part of the dales.

2 *E. media* Fries. Native. Area 3 1. Range 0-100. In the Central Valley in Friarage woods near Yarm, *W. Foggitt!* Near Scarbro' in Raincliffe wood, *W. Bean, Junr.!*

8 *E. ovalis* Bab! Native. Xerophilous. Area 8 7. Range 0-450. In Swaledale upon the Red Scar near Downholme, *Ward!* In Arkendale upon the Main Limestone scars of Copperthwaite moor. About the quarries of Magnesian Limestone at Nosterfield, *Simpson!*

2 *Epipactis palustris* Swartz. Native. Area 8 7 6 5 4 3 2. Range 0-250. Not unfrequent in swamps in the low country and the lower part of the dales. Skeeby, Preston-under-scar, Masham, Carthorpe, Exilby, Hob moor, Hutton Rudby, Guisbro', Uppang, Flazendale, Beckdale, Hovingham, Coneysthorp, Newtondale, Wykeham, &c.

2 *E. ensifolia* Swartz. Native. Area 4 3. Range 100-250. In several places in woods amongst the eastern moorlands. Amongst the arenaceous hills in Northdale woods, Guisbro' spa wood and in the Howardian tract in Cum hag wood. Amongst the calcareous range in Yowlasdale, Rievaulx woods, Duncombe woods, Beckdale and Forge valley.

2 *Orchis Morio* L. Native. Area general. Range 0-300. Common in grassy places throughout the Lower zone, ascending in Wensleydale to the hill top above the Keld head lead mines, where it grows with *Viola lutea*.

1 *O. mascula* L. Native. Area general. Range 0-350. Common in shaded places throughout the Lower zone, ascending to the aboriginal woods upon the edge of Boltby bank.

5 *O. ustulata* L. Native. Area 9 8 7 6 5 3 2 1. Range 0-200. Frequent in grassy places in the low country, ascending in Swaledale to the Round Howe, in Wensleydale to Leyburn and Aysgarth.

5 *O. pyramidalis* L. Native. Xerophilous. Area 8 7 6 5 3 2 1. Range 0-150. In Wensleydale near Bolton Hall, and about the Magnesian Limestone at Marsfield, Gebdykes, Nosterfield and Thorp Arch. In the Central Valley at Bedale, Carthorpe, Kirklington, South Stockton, Cliftonings, &c. Along the eastern calcareous hills in several places; Helmsley, Hovingham, Coneysthorp, Thornton, Yedmandale, Scarbro'.

1 *O. latifolia* L. including *incarnata* L. Native. Area general. Range 0-500. Frequent in grassy places and woods, ascending to the scars of Skellgill and the plateau of Holwick fell.

1 *O. maculata* L. Native. Area general. Range 0-550. Common in damp places, ascending almost to the edge of the Upper zone on the slope of Micklefell towards Maze beck.

1 *Gymnadenia conopsea* R. Br. Native. Area 9 8 7 6 4 3 2 1. Range 0-450. Frequent in damp and grassy places in the dales, ascending to Upper Cronkley and the Main Limestone scars of Keasdon. In the Central Valley at Theakstone, Exilby, Burniston and Thirsk. This species and several others not registered as Montane have a role not very different from some of the plants placed in the Montane category.

1 *Habenaria bifolia* R. Br. including *chlorantha* Bab. Native. Area

9 8 7 5 4 3 2 1. Range 0-400. Frequent in shaded places amongst the hills, ascending in the Yore district to the upper part of Coverdale, in Swaledale to Raven's Seat. In the Central Valley on Carthorpe moor, Stockton forest and in Crathorn woods. Of the two species *H. chlorantha* is with us the most frequent and has the widest vertical range. The genuine *bifolia* grows upon the Hambleton plateau near Hambleton house, at an elevation of 300 yards.

1 *Habenaria viridis* R. Br. Native. Area general. Range 0-400. Frequent in grassy places, ascending in Teesdale to Upper Cronkley, and as high in Widdale.

3 *H. albida* R. Br. Native. Montane. Area 9 8 7 3. Range 200-450. In grassy places in several stations amongst the hills. In the west at Upper Cronkley, Winch bridge, Hudswell, Whitfell gill and Thoraby. In the east amongst both ranges; Northdale, Hawnby, Helmsley, Dowthwaite dale, Newtondale and Hole of Horcum.

2 *Ophrys apifera* Huds. Native. Xerophilous. Area 8 7 6 3. Range 50-200. In the western dales in woods and grassy places at Hipswell, West Burton, Aysgarth force and Ellershaw near Wensley. About the Magnesian Limestone at Thorp Arch and Gebdykes near Masham. In the Central Vale on Carthorpe moor. Amongst the eastern calcareous hills in several places; the Harriot Air, Rievaulx terrace, Beckdale, Dowthwaite dale, Hildenley wood, Forge valley.

2 *O. muscifera* Huds. Native. Xerophilous. Area 7 6 3. Range 50-200. In the western dales at West Burton, Coverham and Ellershaw. About the Magnesian Limestone at Thorp Arch and Marsfield near Masham. Amongst the eastern calcareous hills in numerous stations; Hawnby bank, Flazendale, Old Byland, Rievaulx, Beckdale, Cawklees wood, Oxcar's wood, Dowthwaite dale, Thornton dale, Yedmandale, &c. This species and the preceding, like *Convallaria majalis*, furnish typical illustrations of the Xerophilous role.

*Malaxis paludosa* Swartz. Incognit. This species was found by a miner of the name of John Binks, who lived at Middleton in Teesdale about fifty years ago, upon the spur of hill upon the Yorkshire side of the High Force, but I am not aware that it has been met with recently.

7 *Cypripedium Calceolus* L. Native. Area 3. Range 150. The best known station for this species is in Ouldray gill near Helmsley, where it has been gathered by several botanists. Mr. J. H. Phillips of Beadlam grange saw the plant there in flower in 1849. It has also been met with in the main dale of Rye between Hawnby and Rievaulx, and may not

unlikely occur in some of the dense aboriginal woods of other glens of the eastern calcareous range.

2 *Iris fetidissima* L. Native. Area 8 7 5 3 2 1. Range 0-100. Rare in watery places in the low country. Kirklington, Little Nunwick, Raskelf, Nether Silton, Helmsley, and in Cleveland between Busby and Kirby, and on the banks of the mill-race at Easby.

1 *I. Pseudacorus* L. Native. Area general. Range 0-150. Common in watery places in the low country, ascending to Gormire.

*Crocus vernus* and *C. aureus* are both occasional stragglers from garden cultivation.

2 *Narcissus Pseudo-narcissus* L. Native. Area 9 8 6 5 4 3. Range 0-150. Often simply subspontaneous in fields and orchards (this usually the full-flowered state), but clearly indigenous in woods amongst the lower levels of the hill-country in several places. Probably a true Native about the Magnesian Limestone at Pierse bridge and Thorp Arch, and on the east in Langbargh woods, Goathland dale, Rosedale, in Eskdale near Egton bridge, Harwood dale, Yedmandale, Cloughton and Raincliffe. *N. poeticus* is or has been subspontaneous in the castle yard at Pickering. *N. biflorus* occurs in a field by the side of the road between Richmond and Aske, and at Thornborough, and near the Kilvington Roman Catholic chapel near Thirsk. *N. incomparabilis* grows with *biflorus* at Kilvington, and has also been gathered in a field near Guisbro' Spa. *Galanthus nivalis* is frequently subspontaneous in parks and near gardens, but I have no hesitation in placing it with the three *Narcissi* in the Alien category, so far as North Yorkshire is concerned.

*Lilium Martagon* L. Alien. Occasionally subspontaneous in the neighbourhood of gardens. Hedgebank at St. Martin's near Richmond, *Ward*. Wood near the hall at Thorp Arch, *Backhouse*. Plantation by the Swale side below Aisenby. I have seen a specimen of *Tulipa sylvestris* from the neighbourhood of Malton, but do not know upon which side of the Derwent it was gathered.

7 *Allium Scorodoprasum* L. Native. Area 8 7 6 5 3 2. Range 0-200. Not unfrequent in grassy places in the low country. Thoraby, Carperby, East Witton, Middleham, Ripon, Carthorpe, Thorp Arch, Monkton, Langbargh rigg, Skipton bridge, Thirsk, Borrowby, Coneysthorp, &c.

5 *A. oleraceum* L. Native. Area 8 7 6 3 2 1. Range 0-200. Not unfrequent in similar situations to the preceding. Richmond, Easby, Carperby, Jerveaux, Carthorpe, Nether Poppleton, Acomb, Holdgate, Haxby, Thirsk, Kilvington, Newburgh, Hovingham, &c.

2 *Allium vineale* L. Native. Area 8 6 3 2 1. Range 0-200. Not unfrequent in similar situations to the two preceding, ascending to Aisla-beck near Richmond. *A. Schanoprasum* is reported by Mr. Flintoff in the Botanist's Guide from meadows at Kirby-moorside.

1 *A. ursinum* L. Native. Area 9 8 7 5 4 3 2 1. Range 0-350. Common in shaded places throughout the Lower zone, ascending in Teesdale to Unthank, in Swaledale to thickets below the Main Limestone scars of West Stonesdale moor.

7 *Gagea lutea* Ker. Native. Area 9 8 7 5 3 2. Range 0-250. Not unfrequent in shaded places, especially in the lower part of the dales. In the west at Cotherstone, Brignal, Rokeby, Applegarth, Richmond and Wensley, and about the Magnesian Limestone at Pierse bridge, Thorp Arch, Marsfield and Brown Holme near Masham. In the Central Valley at Brompton-on-Swale, Camphill, and in a wood on the south side of the Swale near Leekby carr. On the east in Newton wood and near Little Ayton, in the Vale of Mowbray at Leake and Mount St. John, and amongst the calcareous hills and in the Howardian tract in numerous stations.

2 *Ornithogalum umbellatum* L. Denizen. Area 8 6 3 2. Range 0-100. In the neighbourhood of Thirsk this species grows in a meadow scattered over at least an acre of what seems to be unbroken grazing ground, and also in smaller quantity in another meadow in the same vicinity, in both cases associated only with truly indigenous plants. It has also been met with at Carthorpe, Middlethorp near York, on Terrington Broats and in Forge valley.

1 *Hyacinthus non-scriptus* L. Native. Area general. Range 0-350. Common in woods and upon the borders of heaths throughout the Lower zone, ascending in Swaledale to Keld, in Arkendale to Shaw wood.

*Ruscus aculeatus* L. Alien. Subspontaneous in two or three places, but apparently without any claim to be considered an indigenous plant.

8 *Convallaria bifolia* L. Native. Area 3. Range 150-200. Upon the wooded escarpment of the eastern calcareous range on the slope of Hutton Bushel moor towards Everley, scattered over a space of ground ninety yards in length. Found in 1857 by Messrs. Reynolds and Braby. This is the only British station where the plant is clearly indigenous. It is widely distributed upon the Continent from Scandinavia southward, and is plentiful in the Northern United States.

5 *C. majalis* L. Native. Xerophilous. Area 9 8 6 3. Range 50-300. In the west near the Tees below Holwick, in Swaledale in the Round Howe woods and about the Magnesian Limestone at Thorp Arch.

Amongst the eastern calcareous range in numerous stations; Hawnby, Old Byland, Rievaulx, Beckdale, Wrelton, Kingthorp woods, Yedmandale, Forge valley, and in the Howardian tract in Wath, Slingsby and Cum-hag woods.

2 *Convallaria multiflora* L. Native. Area 8. Range 150. In Swaledale by the side of the river opposite Applegarth, *Ward!* Reported also by Archdeacon Peirson from Newburgh woods.

1 *Paris quadrifolia* L. Native. Area general. Range 0-250. Frequent in shaded woods in the lower part of the dales and amongst the slopes.

2 *Tamus communis* L. Native. Area general. Range 0-250. Frequent in woods and hedges, ascending to the lower part of Waldendale.

2 *Colchicum autumnale* L. Native. Area 8 7 6 5 3 2 1. Range 0-150. Not unfrequent in damp fields and about stream-sides in the low country. Richmond, West Witton, Bolton woods, Thornton Watlas, Newby Wiske, Thorp Arch, York, Thirsk, Topcliffe, Thirkleby, Malton, &c.

4 *Tofieldia palustris* Huds. Native. Montane. Area 9. Range 400-600. In Teesdale upon the plateau of Cronkley fell, and in the open ground below Cronkley scars.

2 *Hydrocharis morsus-ranæ* L. Native. Area 8 7 6 3 2 1. Range 0-100. Not unfrequent in ponds and slow streams in the low country. In the Central Vale at Pickhill, Ainderby carra, Ripon, Newby Wiske carr, Raskelf, Askham bogs, Hob moor brickponds, and in the Vale of Pickering in the Derwent above Malton.

*Anacharis Alismastrum* Bab. Alien. Subspontaneous in the Wiske and in a pond at Kirby Wiske, in the old course of Codbeck in Sowerby flats, and in the Clifton ings ditch, and amongst the Foss islands near York.

*Stratiotes aloides* L. Alien. Subspontaneous or planted in some of the ditches on the Sion hill estate near Kirby Wiske, and in a pond at Leeming.

1 *Alisma Plantago* L. Native. Area general. Range 0-200. Common in ponds and ditches in the low country.

1 *A. ranunculoides* L. Native. Area 8 7 6 3 2 1. Range 0-250. Frequent in ponds and ditches in the low country, ascending to Bellerby and Downholme moor.

8 *A. natans* L. Native. Area 8. Range 50. In the Central Valley in a pond on Carthorpe moor, *Hebblethwaite!*

2 *Sagittaria sagittifolia* L. Native. Area 8 5 3 2 1. Range 0-100. In the Central Valley about the Wiske at Yafforth and in Kirby Wiske



carr, in the ditches at South Stockton and along the course of the Foss in several places; also in Slingsby carr and in the Derwent at Malton.

2 *Butomus umbellatus* L. Native. Area 8 7 5 3 2 1. Range 0-100. With the preceding in all the stations enumerated, and also in ditches at Snape, Pickhill and Great Ayton, in the mill-cut at Masham, and in the Swale at Topcliffe mill.

1 *Triglochin maritimum* L. Native. Maritime. Area 5 4 3. Range C.L. In the salt-marshes at Middlesbro' and Coatham, and more sparingly at Scarbro' and about the Esk at Whitby.

1 *T. palustre* L. Native. Area 9 8 7 6 5 4 3 2. Range 0-600. Frequent in damp places, ascending to the plateau of Cronkley fell and the tarn on the Lunedale slope of Micklefell.

7 *Scheuchzeria palustris* L. Native. Area 8. Range 50. In the Central Valley in the peat bogs of the swampy parts of Leckby carr. Discovered by Dalton.

2 *Potamogeton densus* L. Native. Area 9 8 7 6 5 3 2 1. Range 0-100. Frequent in ponds and slow streams in the low country.

1 *P. pectinatus* L. Native. Area 8 7 6 5 4 3 2 1. Range 0-150. Frequent in ponds and slow streams in the low country, ascending in the Esk district into Sleddale. A maritime form grows in the salt-water ditches at Middlesbro' and Coatham.

2 *P. flabellatus* Bab! Native. Area 8 6 3 2 1. Range 0-100. Plentiful in the Swale at Skipton bridge and Topcliffe, the Ouse along Cliftonings, and the Derwent below Malton.

1 *P. pusillus* L. Native. Area 8 7 5 4 3 2. Range 0-350. Frequent in ponds and ditches, ascending in Arkendale to the reservoir of the Moulds low-level lead-mine. *P. compressus* L. is reported from a pond at St. Trinian's near Richmond, Ward; and the Foss at York, Moore.

2 *P. gramineus* L? Native. Area 3. Range 0-100. In the Derwent at Crambeck, Flora. Ponds at Castle Howard, Teesdale. In the Mere at Scarbro', Blozam. *P. zosterifolius* is reported by Teesdale from a rivulet at Hovingham, but has not been seen recently.

1 *P. crispus* L. Native. Area general. Range 0-250. Common in the ponds and streams of the low country, ascending to Seamer water.

1 *P. perfoliatus* L. Native. Area 8 7 3 2. Range 0-100. Like the preceding, but less frequent, and not ascending into the dales.

2 *P. lucens* L. Native. Area 8 3 2 1. Range 0-150. In a pond at St. Trinian's, Ward. Abundant in the Foss at York and in the lower part of the Derwent: also more sparingly in Gormire and Scarbro' mere.

The Gormire plant is erroneously given as *prælongus* in Suppl. Flo. Yorks.

1 *Potamogeton heterophyllus* Sieb. Native. Area 8 3 2 1. Range 0-300. In the west on Downholme moor, *Ward*; and frequent about Bedale, *Simpson*. Plentiful in Gormire, and in the Foss reservoirs below Yearsley, and lower down the river about York.

1 *P. rufescens* Schrad. Native. Area 8 3. Range 0-100. Ponds at St. Trinian's, *Ward*. In the Howardian tract in Bulmer fields near Castle Howard, *Hebblethwaite*. Pond near Scarbro', *Bean*! Abundant in Newtondale beck from the upper part of the dale as far down as Levisham.

1 *P. natans* L. Native. Area general. Range 0-150. Common in ponds in the low country, ascending to Wensley and Aske.

1 *P. oblongus* Viv. Native. Area 9 8 7 5 4 3 2. Range 0-550. Common in peaty pools, especially amongst the hills, ascending to the plateau of Cronkley fell.

2 *P. plantagineus* Duer. Native. Area 8 4. Range 0-150. Pond by the side of the railway between Sinderby and Melmerby, *Hebblethwaite*! Bogs near the Black beck in Baysdale, *Mudd*!

1 *Zostera marina* L. Native. Maritime. Area 5. Range C.L. In several places upon the shore of the Tees estuary.

1 *Ruppia maritima* L. Native. Maritime. Area 5. Range C.L. Abundant in some of the salt-water ditches in Coatham marshes. Our plant is the true *maritima*.

1 *Zannichellia palustris* L. Native. Area 8 5 3 2 1. Range 0-150. Frequent in ponds and ditches in the low country. Our inland plant is the *Z. repens* Bonng, and *Z. pedicellata* Fries grows in the salt-water ditches at Middlesbro' and Coatham.

1 *Lemna minor* L. Native. Area general. Range 0-300. Common in ponds and ditches throughout the Lower zone.

2 *L. gibba* L. Native. Area 1. Range 0-100. In the Central Valley in Sheriff Hutton carr and in the lower part of the Foss.

2 *L. polyrhiza* L. Native. Area 3 2 1. Range 0-100. Ponds and slow streams in the low country, rare. Newsham carr, Baskelf, Sheriff Hutton carr, Flaxton, Stockton forest, Castle Howard, and in the lower part of the Foss.

2 *L. trisulca* L. Native. Area 8 6 5 3 2 1. Range 0-100. Not unfrequent in ponds and ditches in the low country. Kirby Wiske, Hob moor brickponds, Askham bogs, Long Marston, Stokesley, Great Ayton, Coatham marshes, Thirsk, Bagby, Topcliffe, Crambeck, Scarbro', &c.

2 *Arum maculatum* L. Native. Area general. Range 0-250. Frequent upon hedgebanks and in woods in the Lower zone, ascending nearly to the summit of Hood hill.

2 *Acorus Calamus* L. Native. Area 3 2 1. Range 0-200. Watery places, rare. About the Ouse near Kirby hall, and at the landslip pond above Kirby Knowle. By the Derwent side at Howsham, and found formerly on the banks of the fishpond at Castle Howard.

1 *Sparganium minimum* Fries. Native. Area 8 7 6 3 2 1. Range 0-100. Not unfrequent in ponds and slow streams in the low country. Skeeby, Sedbury, Hutton Conyers, Pickhill, Kirklington, Wath, Kirby Wiske, York, Skipton, Buttercrambe moor, Scarbro' mere, &c.

1 *S. simplex* Huds. Native. Area 8 6 5 4 3 2 1. Range 0-100. Frequent in ponds and ditches in the low country.

1 *S. ramosum* Huds. Native. Area general. Range 0-250. Frequent in ponds and ditches, ascending in Teesdale to the fishpond on Lartington moor, in Swaledale to Summer lodge beck near Crackpot, in the Yore district to Seamer water.

1 *Typha latifolia* L. Native. Area 8 7 6 5 4 3 2 1. Range 0-100. Frequent in ponds in the low country, ascending to the Foss reservoirs.

2 *T. angustifolia* L. Native. Area 6 5 3 2. Range 0-100. In similar situations to the preceding, but rarer. In the Central Vale at Hob moor, Busby Stoop, and between Sowerby and Sessay. In Cleveland near Great Ayton. In the Vale of Pickering at Howe bridge and in Scarbro' mere.

1 *Juncus conglomeratus* L. Native. Area general. Range 0-400. Frequent in damp places, ascending to the foot of Great Whernside.

1 *J. effusus* L. Native. Area general. Range 0-800. Common in ditches and damp places, ascending to the peak of Nine Standards and the Main Limestone of Micklefell.

2 *J. glaucus* Sibth. Native. Area general. Range 0-400. Common in damp places, ascending to the upper part of Upton gill, Penhill, and as high on the slope towards Arkendale of Booze moor.

2 *J. diffusus* Hoppe. Native. Area 9 7 2. Range 0-250. Damp places, rare. In the Yore district on the east of Seamer water. In the Central Valley between Barton and Halnaby, in ditches at Newsham, fields near the Woodend railway bridge, and ponds at Busby Stoop. About the pond above the landslip at Kirby Knowle.

1 *J. maritimus* Sm. Native. Maritime. Area 5 4. Range C.L. Amongst the sandhills in front of the village of Coatham, and found also by the Rev. G. E. Smith in the neighbourhood of Whitby.

1 *Juncus acutiflorus* Ehrh. Native. Area general. Range 0-400. Common in watery places, ascending to Urra moor over Bilsdale.

1 *J. lamprocarpus* Ehrh. Native. Area general. Range 0-600. Common in watery places, ascending to the edge of the Upper zone on Great Whernside. A curious maritime form grows in the salt-marshes at Coatham.

1 *J. supinus* Moench. Native. Area general. Range 0-650. Common in damp places, ascending to a tarn on the edge of the fell on the north of the source of the Swale.

2 *J. obtusiflorus* Ehrh. Native. Area 8 6 2. Range 0-200. In the west in Skeeby marsh and about a pond at St. Trinian's. In the Central Valley in Ainderby carr, Kirby Wiske carr, Askham bogs, a carr between Askham Richard and Healaugh, and ditches near the Woodend railway bridge. About the pond above the landslip at Kirby Knowle.

1 *J. compressus* Jacq. Native. Area 5 3 2 1. Range 0-100. Not unfrequent in damp fields in the low country. Kirkleatham, Thirsk, York, Ganthorpe, &c.

1 *J. cænosus* Bich. Native. Maritime. Area 5 4. Range C.L. Plentiful in the salt-marshes about Middlesbro' and Coatham: and occurring also at Runswick and by the Esk side at Whitby.

1 *J. bufonius* L. Native. Area general. Range 0-550. Frequent in damp places, ascending to Upper Cronkley and Hollow mill cross.

1 *J. squarrosus* L. Native. Area 9 8 7 5 4 3 2 1. Range 0-850. Common upon heathery ground, ascending to the peaks of Micklefell, Great Whernside, Lovely Seat, &c. Next to Calluna, perhaps the commonest plant of the moors. My friend Jas. Backhouse sends from Micklefell a form which in its habit of growth curiously resembles *J. castaneus*, the occurrence of which has most likely given rise to the record of that species as a Teesdale plant.

*J. triglumis* L. Alien. Upon the banks of the stream upon the plateau of Cronkley fell this species grows sparingly, and it is said to have been planted there by John Binks. Upon Widdy bank it is plentiful.

1 *Luzula sylvatica* Bich. Native. Area 9 8 7 6 5 4 3 2. Range 0-600. Frequent in woods and upon cliffs amongst the hills, ascending to Cronkley fell.

1 *L. pilosa* Willd. Native. Area general. Range 0-500. Common in shaded places, ascending to Cronkley scars.

1 *L. campestris* R. Br. Native. Area general. Range 0-850. Common in grassy places, ascending to the peak of Micklefell.

1 *L. multiflora* Lej. Native. Area general. Range 0-700. Common in grassy and heathery places, ascending to the peak of Dodfell.

1 *Narthecium ossifragum* L. Native. Area 9 8 7 5 4 3 2 1. Range 0-650. Frequent in swamps, especially amongst the hills, ascending above the Main Limestone upon Water Crag and Dodfell.

SUMMARY. Under this chapter 104 species are included, 11 of which are Aliens, 1 a Denizen, and 92 Natives. Of the two latter categories of citizenship 92 are plants of the Lower, 29 of the Middle, and 6 of the Upper zone: and they range under the types of distribution as follows, viz.; British 48, English 31, Scottish 2, Highland 1, Germanic 4, Intermediate 4, Local 3.

## CHAPTER XX.

### GLUMACEÆ.

*Cyperus fuscus* L. Incognit. The report of this species from Codhill moor appears to be erroneous, the mistake seeming to have arisen through inadvertent mingling of examples of the plant procured from the South of England with a packet of specimens from that locality.

2 *Cladium Mariscus* R. Br. Native. Area 6 3. Range 0-100. In the Central Valley in Askham bogs and on Buttercrambe moor near York. Reported by Teesdale from Terrington carr, but now extinct there.

1 *Schœnus nigricans* L. Native. Area 8 4 3. Range 0-150. Swamps in the low country, rare. Skeeby marsh, Kirklington carr, ditches at Topcliffe, Yowlasdale, Flazendale, Beckdale, Marske and Randaymere near Sleights.

1 *Rhynchospora alba* Vahl. Native. Area 8 3. Range 0-100. Rare in heathery swamps. Plentiful in Leckby carr. In the Howardian tract on Slingsby moor and in Terrington carr.

2 *Blysmus compressus* Panz. Native. Area 9 8 7 5 4 3 2 1. Range 0-400. Frequent in oozy places, especially in the calcareous dales. In the west it is often associated with *Parnassia*, and ascends to the upper part of Coverdale and as high in Widdale. It grows amongst the coast sandhills at Coatham and Saltburn. In the Central Valley I know of it in one station only, by the Tees side at Stapleton.

1 *Scirpus lacustris* L. Native. Area 9 8 7 6 5 3 2 1. Range 0-250. Frequent in ponds and slow streams, ascending to Seamer water and the Foss reservoirs.

2 *S. glaucus* Smith. Native. Maritime. Area 5. Range C.L. In some of the salt-water ditches that intersect the marshes at Middlesbro' and Coatham, specially plentiful at the decoy pond.

1 *Scirpus setaceus* L. Native. Area 8 5 4 3 2 1. Range 0-550. Frequent in damp places, ascending in Swaledale to Crook seat and Hollow mill cross.

1 *S. maritimus* L. Native. Maritime. Area 5 4. Range C.L. Common in the salt-water ditches about Middlesbro' and Coatham, and occurring also at Runswick bay, and near the Esk at Whitby.

1 *S. sylvaticus* L. Native. Area general. Range 0-150. Frequent in watery places in the low country, ascending to Levisham and the Foss reservoirs.

1 *S. palustris* L. Native. Area general. Range 0-400. Frequent in watery places, ascending in Teesdale to Upper Cronkley.

1 *S. multicaulis* Sm. Native. Area 3. Range 100. In the Howardian tract in swampy ground on Slingsby moor, *Ibbotson*!

1 *S. pauciflorus* Lightf. Native. Montane. Area 9 8 7 3. Range 0-700. Frequent in oozy places amongst the western hills, ascending to the northern slope of Micklefell, descending to Cotherstone and Aysgarth force. In the Central Valley by the Tees side at Stapleton. In Cleveland on Codhill and Sleights moors, and reported also by Brunton from the neighbourhood of Malton.

1 *S. caespitosus* L. Native. Area general. Range 0-850. Common in heathery swamps, ascending to the peaks of most of the higher hills.

2 *S. acicularis* L. Native. Area 7 3 2 1. Range 0-100. Ponds and swamps in the low country. Plentiful upon Pilmoor, Stockton forest and Strensall common. In the Howardian tract in Terrington carr and the fishpond in Castle Howard park. Reported also from the neighbourhood of Masham.

1 *S. fluitans* L. Native. Area 9 8 6 3 2 1. Range 0-400. In similar situations to the preceding, but with a wider vertical range. In the west on Downholme moor and in the pond at the foot of Cronkley scars. In the Central Valley on Carthorp moor, Hob moor, Stockton forest, Strensall common, &c. Plentiful in Gormire and Terrington carr.

1 *Eriophorum vaginatum* L. Native. Area 9 8 7 5 4 3 2 1. Range 0-750. Common upon damp heaths, ascending to the peaks of Dodfell and Nine Standards and the peat-bog below the Main Limestone of Micklefell on the north.

1 *E. angustifolium* Roth. Native. Area general. Range 0-800. Common in swampy places, ascending to the peaks of Dodfell and Micklefell.

1 *E. latifolium* Hoppe. Native. Area 9 8 7 3. Range 100-400. In the west near Winch bridge, in Skeeby marsh, in a bog near the head of

Waldendale, and by the Yore side at Aysgarth force. On the east in Snailsworth, Flazendale and Beckdale, and formerly in a bog on the east side of Castle Howard park.

8 *Eriophorum gracile* Koch. Native. Area 9. Range 100. Found by Mr. Woods with *Ranunculus Lingua* in Halnaby carr near Croft.

7 *Elyna caricina* M. & K. Native. Montane. Area 9. Range 400-600. In Teesdale on the banks of the stream on the plateau of Cronkley fell, and in the open ground between the scars and the river.

3 *Carex dioica* L. Native. Area general. Range 0-600. Frequent in swampy ground, ascending to the plateau of Cronkley fell.

1 *C. pulicaris* L. Native. Area 9 8 7 6 4 3 2 1. Range 0-700. Frequent in swampy ground, ascending to the northern slope of Micklefell and the Main Limestone of Camfell.

4 *C. pauciflora* Lightf. Native. Montane. Area 3. Range 200-250. Banks of the Derwent near Lilla cross, and several boggy places between Whitby and Pickering, *Middleton!*

1 *C. stellulata* Good. Native. Area general. Range 0-750. Common in swampy places, ascending to the peak of Nine Standards and the springs which issue from the Main Limestone of Micklefell.

1 *C. ovalis* Good. Native. Area 8 7 6 5 4 3 2 1. Range 0-450. Common in damp places, ascending to the lower part of Birkdale and the ridge of Harlen fell.

1 *C. curta* Good. Including *vitis* Fries. Native. Area 9 8 7 5 4 3 2 1. Range 0-750. Frequent in swampy ground, ascending to the springs which issue from the Main Limestone of Micklefell.

1 *C. remota* L. Native. Area general. Range 0-350. Common in ditches and damp woods, ascending in Swaledale to Keasdon woods.

2 *C. axillaris* Good. Native. Area 8 6 3 2. Range 0-100. Plentiful amongst the brickponds at Hob moor near York. Reported also from Love Lane near Richmond, *Ward*; Carthorpe moor near Bedale, *Simpson*; a bog at Wildon near Coxwold, *Peirson*; and Newtondale, *Flora*.

2 *C. intermedia* Good. Native. Area 9 8 7 6 3 2 1. Range 0-100. Frequent in damp fields in the low country.

1 *C. arenaria* L. Native. Maritime. Area 5 4. Range C.L. Plentiful amongst the coast sandhills about Coatham, Redcar, Marske and Saltburn.

1 *C. muricata* L. Native. Area general. Range 0-250. Frequent upon dry banks in the low country, ascending in Wensleydale to Redmire.

2 *C. divulsa* Good. Native. Area 8 7 3 2. Range 0-150. In similar



situations to the preceding, but rare. Near Wensley and by the foot road between Richmond and Easby, *Ward*. Hedgebank by the side of the highroad below Feliskirk. In the Howardian tract at Ganthorpe and in Cum hag wood, *Ibbotson*!

1 *Carex vulpina* L. Native. Area 9 8 6 5 4 3 2 1. Range 0-100. Common in damp places in the low country.

1 *C. teretiuscula* Good. Native. Area 9 7 4 3 2. Range 0-150. Plentiful in some of the low country carrs. Halnaby carr, Tanfield hall carr, Newsham carr, &c. In Cleveland in bogs in Sleddale, *Mudd*! In the Howardian tract in Terrington carr, and formerly in a bog near Castle Howard, *Ibbotson*! Marsh near Raincliffe wood, *W. Bean, Junr.*!

8 *C. paradoxa* Willd. Native. Area 6. Range 50. In the Ainsty in a carr between Healaugh and Askham Richard, and plentiful in Askham bogs. A species widely diffused upon the Continent, but which is singularly local in Britain. There is only one other strictly British locality, and one in Ireland.

1 *C. paniculata* L. Native. Area 8 7 6 5 4 3 2 1. Range 0-250. Frequent in swamps, ascending in Wensleydale to Askrigg.

1 *C. vulgaris* Fries. Native. Area general. Range 0-750. Common in damp places, ascending to the plateau of Pin seat, and the springs which issue from the Main Limestone of Micklefell.

4 *C. rigida* Good. Native. Montane. Area 9. Range 850. Heatherly places upon the gritstone peak of Micklefell. The only species, except *Myosotis alpestris*, which is restricted to the Upper zone.

2 *C. stricta* Good. Native. Area 9 8 6 5 3. Range 0-100. Plentiful in several of the low country swamps. Halnaby carr, Ainderby carr, Newsham carr, Askham bogs, Scarbro' mere, and in Cleveland in a bog below Captain Cook's monument on Kildale moor.

1 *C. acuta* L. Native. Area general. Range 0-200. Common in damp places in the low country, ascending to Wensley and the upper part of Newtondale.

1 *C. flava* L. including *C. Oederi* Ehrh. Native. Area general. Range 0-750. Common in damp places, ascending to the springs which issue from the Main Limestone of Micklefell.

1 *C. extensa* Good. Native. Maritime. Area 5 4. Range C.L. Amongst the salt-marshes at Coatham and near the Esk at Whitby.

1 *C. pallascens* L. Native. Area general. Range 0-300. Common in damp places, ascending in Swaledale to Keasdon force.

1 *C. fulva* Good. Native. Area 9 8 7 4 3 2 1. Range 0-600.

Frequent in damp places amongst the western hills, ascending to the plateau of Cronkley fell. In the Central Valley at Croft. Amongst the eastern hills in numerous stations; Sleddale, Flazendale, Gurtof gill, Beckdale, Coxwold, Foss reservoirs, Hole of Horcum, &c.

1 *Carex distans* L. Native. Maritime. Area 5. Range C.L. Amongst the salt-water ditches about the mouth of the Tees and in Coatham marshes.

1 *C. binervis* Smith. Native. Area 9 8 7 5 4 3 2 1. Range 0-850. Frequent upon heaths, ascending from the Central Valley to the peak of Micklefell.

1 *C. laevigata* Smith. Native. Area 4 3. Range 0-150. Banks of the Goathland dale stream near Walking Mill foss. Raincliffe wood near Scarbro', *W. Bean, Jun.* Found also by Mr. Peterkin in the neighbourhood of Hackness.

1 *C. panicea* L. Native. Area general. Range 0-750. Common in damp places, ascending to the springs which issue from the Main Limestone of Micklefell.

4 *C. capillaris* L. Native. Montane. Area 9. Range 400-700. In Teesdale upon the Sugar Limestone of the Cronkley plateau, and also upon the limestone edges of the northern slope of Micklefell, and in the open ground in front of Cronkley scars.

3 *C. limosa* L. Native. Area 8 7 3 1. Range 0-100. In a few of the carrs of the low country. Tanfield hall carr, Leckby carr, Suett carr near Sutton on the Forest, and Terrington carr.

1 *C. sylvatica* Huds. Native. Area general. Range 0-400. Common in damp woods, ascending in Swaledale to Gunnerside gill, in Arkendale to Shaw beck woods.

1 *C. pendula* Huds. Native. Area 9 8 5 4 3. Range 0-150. Swampy woods, not uncommon. On the west in Clink Bank woods and Easby woods near Richmond, and in the Central Vale in a wood by the Tees side between Stapleton and Croft. In Cleveland in numerous localities; Kildale, Wilton, Saltburn, Arncliffe woods, Goathland dale, Sleights, Mulgrave woods, &c. Near the Rye at Rievaulx and plentiful in Forge valley.

2 *C. pseudo-cyperus* L. Native. Area 7 6 3 1. Range 0-100. In the Central Valley in a bog near the Yore at Ripon, about the Ouse along Clifton Ings, in Askham bogs and at the Hob moor brickponds. In the Howardian tract at Castle Howard.

1 *C. glauca* Scop. Native. Area general. Range 0-750. Common in dry and damp places, ascending to the peak of Great Whernside.

1 *C. præcox* Jacq. Native. Area 9 8 6 5 4 3 2. Range 0-600.

Common upon dry banks, ascending to the Sugar Limestone of Cronkley fell.

1 *Carex pilulifera* L. Native. Area 9 8 7 5 4 3 2 1. Range 0-600. Common in damp places, ascending to the plateau of Cronkley fell.

2 *C. digitata* L. Native. Xerophilous. Area 7 3. Range 0-200. In the Yore district in Magdalen woods near Tanfield, *Simpeon*. Amongst the eastern calcareous hills plentiful upon Hawnby bank and in Ouldray gill, and found also by Mr. Reynolds near Hackness.

3 *C. filiformis* L. Native. Area 8 7 6 5 3 2 1. Range 0-200. Frequent in damp places in the low country.

1 *C. hirta* L. Native. Area 8 7 6 5 4 3 2 1. Range 0-350. Common in damp places throughout the Lower zone, ascending to the upper part of Coverdale.

1 *C. ampullacea* Good. Native. Area general. Range 0-550. Common in swamps both in the low country and amongst the hills, ascending to a pond on the back of Cronkley fell.

1 *C. vesicaria* L. Native. Area 8 7 6 4 3 2 1. Range 0-250. Frequent in swamps, ascending in the Yore district to Seamer water.

1 *C. paludosa* Good. Native. Area 9 8 7 5 3 2 1. Range 0-300. Common in watery places in the Lower zone, ascending in Teesdale to Winch bridge.

1 *C. riparia* Curt. Native. Area 8 6 5 4 3 2 1. Range 0-150. Frequent in swamps in the low country.

*Setaria viridis* Beauv. Alien. Subspontaneous in waste ground near Great Ayton, 1855, *Mudd*!

*S. verticillata* Beauv. Alien. Subspontaneous in garden ground at Camphill, 1858, *Hebblethwaite*!

1 *Phalaris arundinacea* L. Native. Area general. Range 0-400. Common in watery places, ascending to Hawes and Upper Cronkley.

*P. canariensis* L. Alien. Not unfrequently subspontaneous in cultivated fields.

1 *Anthoxanthum odoratum* L. Native. Area general. Range 0-750. Everywhere common in grassy places, ascending to the peak of Great Whernside.

*Phleum tenue* Schrad. *Achnodonton* Beauv. Alien. Of this grass, which is a native of the South of Europe, intermediate between the genera *Phleum* and *Phalaris*, I met with a few specimens in 1862, in a bed of onions in garden ground at Thirsk.

1 *P. pratense* L. Native. Area general. Range 0-400. Common in

grassy places and upon dry banks, ascending in Wensleydale to fields at Simonside. Mr. Hebblethwaite sends a plant which agrees with authenticated specimens of *P. præcox* Jordan from fields at Kirklington.

2 *Phleum arenarium* L. Native. Maritime. Area 5 4. Range C.L. Amongst the coast sandhills at Coatham, Redcar and Marske.

1 *Alopecurus pratensis* L. Native. Area general. Range 0-500. Common in grassy places, ascending in Teesdale to Upper Cronkley, in Swaledale to Crook Seat.

1 *A. geniculatus* L. Native. Area general. Range 0-400. Common in damp places, ascending in Wensleydale to a pool near the Shaw Paddock Inn, and in the West Swale district to the lower part of Birkdale.

2 *A. bulbosus* L. Native. Area 1. Range 50. Along Clifton Ings near York in the meadow opposite the Lunatic Asylum. In Britain usually a plant of salt-marshes.

2 *A. agrestis* L. Colonist. Area general. Range 0-100. Common in cultivated fields in the low country.

1 *Milium effusum* L. Native. Area 9 8 3. Range 0-150. Rare in shaded woods. In Gretadale in the woods by the stream side near Scargill. In Swaledale in a wood near the Round Howe, Ward. On the east on the banks of the Hayburn Wyke stream, W. Bean, Junr.

5 *Apera Spica-venti* Beauv. Colonist. Area 3 2 1. Sandy cultivated fields, rare. In the Central Valley at Catton, Alne and Sutton on the forest. Reported also by Teesdale from Bulmer.

1 *Agrostis canina* L. Native. Area 8 7 6 5 4 3 2. Range 0-500. Frequent in damp places, ascending in the Yore district to Tarn Gill, Widdale.

1 *A. vulgaris* With. Native. Area general. Range 0-850. Everywhere common in grassy places, ascending to the peaks of Mickelfell, Great Whernside, &c. *A. pumila* is frequent amongst the hills.

1 *A. alba* L. Native. Area 9 8 6 5 4 3 2 1. Range 0-450. Frequent in damp places, ascending from the coast salt-marshes to a cascade over the Main Limestone of Gunnerside Gill.

1 *Ammophila arundinacea* Host. Native. Maritime. Area 5 4 3. Range C.L. Common in sandy ground along the coast from Middlesbro' to Scarbro'.

1 *Arundo Phragmites* L. Native. Area general. Range 0-250. Common in watery places, ascending in the Yore district to Seamer water.

2 *A. Calamagrostis* L. Native. Area 8 6 5 3 2 1. Range 0-150. Not unfrequent in damp woods in the low country. In Swaledale near

Hipswell Lodge. In the Central Valley in Askham bogs, Leckby carr, on Stockton forest and by the side of the stream below Northallerton. On the east in a swampy wood below Captain Cook's monument on Kildale moor, in Newburgh woods, Cum hag wood, Thurtell wood, &c.

2 *Arundo Epigejos* L. Native. Area 5 4 3 2. Range 0-150. Not unfrequent in woods and thickets in the low country. In the Central Valley at Carthorpe, Fawdington, and between Thirsk and Woodend. In Cleveland at the foot of Kildale moor, and near the mouth of the stream at Saltburn. In the Howardian tract in Coneysthorpe and Thurtell woods.

4 *Sesleria cærulea* Scop. Native. Montane. Xerophilous. Area 9 8 7. Range 200-800. Frequent upon the limestone scars of the western hills and dales, ascending to the Main Limestone cliffs that crest the western slope of Micklefell, descending to the Yore side at Aysgarth force. See remarks under *Galium sylvestre*.

1 *Aira cæspitosa* L. Native. Area general. Range 0-650. Common in thickets and grassy places, ascending to the limestone pavement of Camfell, and the gritstone plateau of Pin Seat.

1 *A. flexuosa* L. Native. Area 9 8 7 5 4 3 2 1. Range 0-700. Common upon heaths from the Central Valley upwards to the peak of Lovely Seat.

1 *A. caryophyllea* L. Native. Area 8 7 6 5 4 3 2 1. Range 0-300. Frequent upon dry banks throughout the Lower zone, ascending to the edge of the Hambleton plateau near Whitstoncliffe.

1 *A. præcox* L. Native. Area 9 8 7 5 4 3 2 1. Range 0-600. Frequent upon sandy heaths, especially amongst the hills, ascending in Swaledale to Hollow mill cross and the plateau of Pin Seat.

*Avena sativa* L. Commonly cultivated in the low country and up to 350 or almost to 400 yards, and above 200 yards much the most frequent cereal crop. The varieties with a one-sided panicle are most productive in the low country, but the old-fashioned form with a panicle like *A. fatua* is more hardy, and is still often grown upon upland clayey soils.

1 *A. fatua* L. Colonist. Area general. Range 0-300. Frequent in cultivated fields, ascending to the Hambleton plateau above Hawaby.

1 *A. pratensis* L. including *alpina* Smith. Native. Xerophilous. Area 9 8 7 3 2. Range 0-500. Frequent amongst the limestone hills both upon the east and west of the Central Valley, ascending in Swaledale to the south end of Keasdon, in Teesdale to Cronkley and White Force scars. In the Central Valley by the Tees side between Croft and Dalton.

1 *Avena pubescens* L. Native. Area 9 8 7 6 5 3 2 1. Range 0-400. Common in grassy places, ascending in Teesdale to Upper Cronkley.

2 *A. flavescens* L. Native. Area general. Range 0-450. Common in grassy places, ascending in Arkendale to the Main Limestone scars of Copperthwaite moor.

1 *Arrhenatherum avenaceum* Beauv. Native. Area general. Range 0-450. Common in thickets and upon hedgebanks, ascending to Hell gill and the Main Limestone scars of Harlen fell.

1 *Holcus lanatus* L. Native. Area general. Range 0-600. Common in grassy places, ascending to Hollow mill cross and the peak of Great Whernside.

1 *H. mollis* L. Native. Area general. Range 0-450. Frequent in thickets and upon hedgebanks, ascending to the Main Limestone scars of Whitstondale.

1 *Triodia decumbens* Beauv. Native. Area 9 8 7 5 4 3 2 1. Range 0-600. Common in grassy places, especially amongst the hills, ascending to the peak of Great Whernside and the plateau of Cronkley fell.

1 *Koeleria cristata* Pers. Native. Area 9 8 7 6 5 4 3 2. Range 0-600. Frequent on dry banks, especially amongst the hills, ascending to the plateaux of Cronkley fell and the south end of Keasdon.

1 *Melica uniflora* Retz. Native. Area general. Range 0-350. Common in shaded places throughout the Lower zone, ascending to Shaw's gill above Hardraw force and the Main Limestone scars of the northern slope of Keasdon.

3 *M. nutans* L. Native. Montane. Subxerophilous. Area 9 8 7 6 3. Range 100-350. In the west by the Tees side at Winch bridge, on Whitstondale scars, in the Round Howe woods, about the Yore at Aysgarth force, and about the Magnesian Limestone at Thorp Arch. Amongst the woods of the eastern calcareous hills in numerous localities; Hawnby bank, Byland woods, Ouldray gill, Sleightholme dale, &c., and in the Howardian tract. *Rubus saxatilis* is the nearest geographical ally of this species, so far as North Yorkshire is concerned.

1 *Molinia caerulea* Manch. Native. Area general. Range 0-600. Frequent upon damp heaths, ascending from the carrs of the Central Valley to the peak of Great Whernside.

1 *Catabrosa aquatica* Presl. Native. Area 9 8 6 5 3 2 1. Range 0-300. Not unfrequent in oozy places in the Lower zone. Brignal, Hartleap well, Richmond, Pickhill, Camphill, Boltby, Gormire, Kildale, Knavesmire, Terrington, Scarbro', &c.

2 *Glyceria aquatica* Smith. Native. Area 8 6 5 4 3 2 1. Range 0-150. Frequent in ponds and ditches in the low country.

1 *G. fluitans* R. Br. Native. Area general. Range 0-550. Common in watery places both in the low country and amongst the hills, ascending to the plateau of Cronkley fell.

2 *G. plicata* Fries, including *G. pedicellata* Towns. Native. Area 9 8 7 5 4 3 2 1. Range 0-400. Frequent in similar situations to the preceding, especially in the low country, ascending to the foot of Preston scar and the upper part of Coverdale.

1 *G. maritima* M. & K. Native. Maritime. Area 5 4 3. Range C.L. Common in damp places along the coast line from Middlesbro' to Scarbro'.

2 *G. distans* Wahl. Native. Area 7 6 5 4 3 1. Range 0-100. Plentiful in the salt-marshes at Middlesbro' and Coatham, and growing also by the Esk side at Whitby and on the north shore at Scarbro'. Inland upon the Magnesian Limestone at Thorp Arch, and in the Central Valley in sandy ground at Wath and between Heworth and Stockton.

5 *G. Borreri* Bab. Native. Maritime. Area 5. Range C.L. With the preceding plentiful amongst the salt-marshes near Middlesbro', Mudd!

2 *G. procumbens* Smith. Native. Maritime. Area 5 4 3. Range C.L. Along the coast line at Middlesbro', Coatham, Runswick bay, Robin Hood's bay and Scarbro'.

1 *G. rigida* Smith. Native. Area 8 7 6 5 3 1. Range 0-300. Frequent in dry ground in the Lower zone, ascending to the flagstone quarries of Leyburn moor.

2 *G. loliacea* Wats. Native. Maritime. Area 5 3. Range C.L. Amongst the coast sandhills about Coatham and Redcar. At Scarbro' near the old pier, *Bean!*

1 *Poa annua* L. Native. Area general. Range 0-800. Everywhere common in grassy places and waste ground, ascending to the Main Limestone of Micklefell.

1 *P. pratensis* L. Native. Area general. Range 0-800. Everywhere common in grassy places, ascending to the Main Limestone of Micklefell.

1 *P. trivialis* L. Native. Area general. Range 0-500. Common in grassy places and cultivated fields, ascending to Crook Seat, and the Main Limestone scars of Gunnerside gill and Punchard's gill.

1 *P. compressa* L. including *polynoda* Parn. Native. Area general. Range 0-300. Frequent upon walls and in dry places throughout the Lower zone, ascending to the flagstone quarries of Leyburn moor.

1 *Poa nemoralis* L. including *Parnellii* Bab. Native. Area 9 8 7. Range 100-500. In Teesdale at the falls of Maze beck, upon Cronkley and Holwick scars, and near the Tees at the High force, Winch bridge and Eglestone abbey. In Gretaedale at the waterfall below Sleightholme. In the West Swale district upon the Main Limestone scars of Keasdon, Booze moor and Copperthwaite moor. In Wensleydale in Shaw's gill and on the rocks below Hardraw force.

4 *P. Balfourii* Parn. Native. Montane. Area 8. Range 350-400. Amongst the Main Limestone scars in the lower part of Whitstondale, with *Hieracium anglicum*, &c.

1 *Briza media* L. Native. Area general. Range 0-700. Everywhere common in grassy places, ascending to the limestone edges of the northern slope of Micklefell.

1 *Cynosurus cristatus* L. Native. Area general. Range 0-550. Common in grassy places, ascending to Hollow mill cross and the Main Limestone of Keasdon and Booze moor.

*C. echinatus* L. Alien. Casually subspontaneous in cultivated fields. In a field at Great Ayton, periodically for fourteen years, *Mudd!* Amongst *Lolium italicum* in a field between Ganthorpe and Terrington, *Ibbotson*.

1 *Dactylis glomerata* L. Native. Area general. Range 0-450. Common in fields and upon hedgebanks, ascending to the Main Limestone scars of Harlen fell and Copperthwaite moor.

1 *Festuca bromoides* L. Native. Area 8 7 5 4 3 2 1. Range 0-300. Frequent in dry sandy ground throughout the Lower zone, ascending to the edge of the Hambleton plateau near Whitstoncliffe.

2 *F. pseudo-myurus* Will. Native. Area 7 5 3. Range 0-300. In similar situations to the preceding, rare. Amongst the flagstone quarries of Leyburn moor. In Cleveland on Kildale moor, and abundant amongst the Middlesbro' ballast hills. In the Howardian tract in a quarry at Slingsby.

1 *F. ovina* L. Native. Area general. Range 0-850. Common in grassy places, especially amongst the hills, ascending to the peak of Micklefell.

1 *F. duriuscula* L. Native. Area general. Range 0-600. Grassy places, much commoner than the preceding amongst the meadows of the low country, but rarer amongst the hills, ascending to the gritstone plateau of Pin Seat.

1 *F. rubra* L. Native. Area 8 5 4 3 2 1. Range 0-200. Common amongst the coast cliffs and sandhills, and occurring also occasionally inland in sandy ground, ascending in Swaledale to Healaugh.



1 *Festuca elatior* Huds. Native. Area general. Range 0-400. Frequent about streamsides both in the low country and in the dales, ascending to Upper Whitfell force.

1 *F. pratensis* Huds. including *liolacea* Huds. Native. Area general. Range 0-400. Common in grassy places, ascending in Teesdale to Upper Cronkley.

*Ceratocloa unioides* D.C. Alien. Subspontaneous in considerable abundance in a field near Newton in Cleveland, 1854, *Mudd*! Indigenous in North America.

1 *Bromus giganteus* L. Native. Area general. Range 0-350. Common in woods and thickets, ascending to Shaw's gill near Hardraw.

1 *B. asper* L. Native. Area general. Range 0-400. Common in similar situations to the preceding, ascending to Upper Whitfell force and the Main Limestone scars of West Stonesdale moor.

1 *B. sterilis* L. Native. Area general. Range 0-250. Common upon hedgebanks in the low country, ascending in Swaledale to the foot of Applegarth scars.

5 *B. erectus* Huds. Native. Xerophilous. Area 8 7 3. Range 0-150. About the Magnesian Limestone at Nosterfield and in the Central Valley at Kirklington. Plentiful upon the calcareous Howardian terrace at Hovingham, Slingsby and Hildenley.

1 *B. secalinus* L. Colonist. Area 8 5 4 3 2. Range 0-150. Not unfrequent in cultivated fields in the low country.

1 *B. commutatus* Schrad. Native. Area 9 8 5 4 3 2 1. Range 0-300. Frequent in cultivated fields and grassy places throughout the Lower zone, ascending to the Hambleton plateau over Hawnby.

1 *B. mollis* L. including *racemosus* L. Native. Area general. Range 0-500. Common in grassy places, ascending to Gale and Tanhill.

*B. arvensis* L. Alien. Casually subspontaneous in cultivated fields. Upsal castle and between Kilvington and Kirby Knowle, 1855.

1 *Brachypodium sylvaticum* Beauv. Native. Area general. Range 0-350. Common in woods and upon hedgebanks throughout the Lower zone, ascending to the lower part of Gunnerside gill.

5 *B. pinnatum* Beauv. Native. Xerophilous. Area 6 3 2. Range 0-150. Plentiful about the Magnesian Limestone at Thorp Arch, and on the east at Newburgh, and on the Middle Oolite at Nunnington and Hovingham. Professor Sedgwick writes "This grass is so characteristic of the Magnesian Limestone soil that in some instances, where the lower sandstone is brought by a fault to the level of the yellow limestone, the

demarcation may be traced with great exactness by the help of this plant without an excavation."

1 *Triticum caninum* Huds. Native. Area general. Range 0-450. Frequent upon hedgebanks, ascending to the scars of the upper part of Hell gill and the Main Limestone cliffs of Punchard's gill.

1 *T. repens* L. Native. Area general. Range 0-400. Common upon hedgebanks and in cultivated fields, ascending to the Hambleton plateau over Kepwick.

1 *T. acutum* D.C. Native. Maritime. Area 5. Range C.L. Amongst the coast sandhills between Redcar and Marske.

1 *T. pungens* Pers. Native. Maritime. Area 5. Range C.L. Sandy ground amongst the salt marshes at Middlesbro' and Coatham.

1 *T. junceum* L. Native. Maritime. Area 5 4. Range C.L. Amongst the coast sandhills at Middlesbro', Coatham, Marske and Saltburn.

*T. vulgare* L. Commonly cultivated in the low country, but rare above 200 yards, and above 300 yards hardly worth growing. In the Central valley especially there is a wide extent of country well adapted for its cultivation, but beyond its limits Oats and Barley are more generally grown than Wheat.

1 *Lolium perenne* L. Native. Area general. Range 0-500. Common in grassy places, and by roadsides both in the low country and amongst the hills.

*L. italicum* Braun. Alien. Commonly cultivated for forage throughout the Lower zone.

1 *L. temulentum* L. including *arvense* With. Colonist. Area 9 8 7 5 4 3 2. Range 0-100. Not unfrequent as a weed of cultivated fields in the low country.

*L. linicola* Sonder. Alien. Found by Mr. Ward in a cultivated field near Catterick bridge.

3 *Elymus arenarius* L. Native. Maritime. Area 5 4. Range C.L. Sandy ground amongst the Coatham salt-marshes and near Sandsend.

*Hordeum vulgare* is commonly cultivated up to 350 yards. For malting purposes the sandy soils of the Central Valley yield the best crops. *Secale cereale* is now grown but rarely, either by itself or intermingled with Wheat.

1 *H. sylvaticum* Huds. Native. Xerophilous. Area 9 8 6 3. Range 0-150. On the west in Deepdale, Eglestone abbey and Rokeby woods, in Swaledale near Downholme and about the Magnesian Limestone at Thorp Arch. On the east amongst the calcareous hills in Byland wood, Rievaulx woods, Ouldray gill, and in the Howardian tract.

2 *Hordeum pratense* Huds. Native. Area 8 6 5 3 2 1. Range 0-100. Frequent in grassy places in the low country.

2 *H. murinum* L. Native. Area 8 6 5 4 3 2 1. Range 0-150. Frequent in dry ground in the low country, especially along the coast, ascending to the walls of Richmond castle.

2 *H. maritimum* With. Native. Maritime. Area 5. Range C.L. Plentiful in the salt marshes at Middlesbro' and Coatham.

1 *Nardus stricta* L. Native. Area 9 8 7 5 4 3 2 1. Range 0-850. Common upon heaths at all levels, ascending to the peak of Micklefell.

2 *Lepturus filiformis* Trin. Native. Maritime. Area 5 4. Range C.L. Amongst the salt marshes at Middlesbro' and Coatham, and also by the Esk side at Whitby.

SUMMARY. Incognits and segregates excluded, 154 species come under this chapter, 8 of which are Aliens, 5 Colonists, and 141 Natives. Of those which come under the two latter categories of citizenship, 142 are plants of the Lower, 73 of the Middle, and 24 of the Upper zone; and they range under the types of distribution as follows, viz.; British 103, English 26, Scottish 5, Highland 5, Germanic 4, Intermediate 1, Local 2.

## APPENDIX A.

### INTRODUCED PLANTS OF THE MIDDLESBRO' BALLAST HILLS.

The following is a list of the more noteworthy plants which from time to time have been noticed upon the ballast hills near the mouth of the Tees upon the Yorkshire side of the river. A considerable extent of surface which even within the last ten years was waste ground is now (1862) built over, and doubtless a large proportion of the species enumerated have entirely disappeared. The species not otherwise known as plants of North Yorkshire have their names printed in Italics: and all of these, except such as are expressly otherwise localized, are known as Natives or well-established Aliens elsewhere within the limits of Britain.

*Papaver somniferum* L.  
*Fumaria confusa* Jordan.  
*micrantha* Lagasca.  
*Iberis amara* L.  
*Lepidium Draba* L.  
*ruderales* L.

*Camelina sativa* Crantz.  
*Erysimum cheiranthoides* L.  
*Sinapis nigra* L.  
*Reseda Phyteuma* L. Native of  
 Belgium, Switzerland, France  
 and Southern Europe.

*Melilotus vulgaris* Willd.  
*Medicago maculata* Sibth.  
*Trigonella ornithopodioides* D. C.  
*Trifolium subterraneum* L.  
     *incarnatum* L.  
     *striatum* L.  
*Vicia villosa* Host. Inhabits  
 cultivated fields in Scandi-  
 navia, Belgium, France and  
 Southern Europe.  
*Vicia lutea* L.  
*Bupleurum tenuissimum* L.  
*Foeniculum vulgare* Gaertn.  
*Pastinaca sativa* L.  
*Carduus pycnocephalus* L. Na-  
 tive of France and the shores  
 of the Mediterranean.  
*Galactites tomentosa* Mœnch.  
 Native of the shores of the  
 Mediterranean.

*Erigeron acris* L.  
*Calendula officinalis* L.  
*Senecio viscosus* L.  
*Specularia hybrida* A. D. C.  
*Chenopodium olidum* Curt.  
     *hybridum* L.  
     *murale* L.  
     *opulifolium* Schrad.  
 A plant of Scandinavia, Den-  
 mark, Belgium and France.  
*Schoberia fruticosa* Meyer.  
*Polygonum laxum* Reich.  
*Euphorbia Lathyris* L.  
*Mercurialis annua* L.  
*Asparagus officinalis* L.  
*Digitaria humifusa* Pers.  
*Phalaris canariensis* L. var. *picta*.  
*Apera Spica-venti* Beauv.  
*Brachypodium pinnatum* Beauv.  
*Bromus secalinus* var. *inermis*.

## ADDENDA.

Whilst this sheet has been passing through the press I have received from Mr. Robert Braithwaite, now of London, formerly of Whitby, a copious list of the rarer species observed by himself in North East Yorkshire. I give here only the species which he reports from drainage districts in which I have not got them before.

*Stellaria nemorum* L. Area 4. Esk banks in Newbeggin wood.

*Cichorium Intybus* L. Area 4. Eskdale side.

*Arbutus Uva-ursi* L. Area 3. Abundant amongst long ling on the hills between Levisham and Cawthorne camps.

*Ophrys apifera* Huds. Area 4. In the first field on the carrs beyond Ruswarp.

*O. muscifera* Huds. Area 4. Top of cliff near Staithes.

*Dianthus Armeria* will also require to be added to our list of species. I have received a number of specimens from Mr. Ibbotson, gathered 1 July, 1862, on a sandy bank at Skelton (Ouse and Foss district.)

## CHAPTER XXI.

### PTERIDOIDES.

2 *Ceterach officinarum* Willd. Native. Xerophilous. Area 7. Range 250. In Wensleydale upon a wall in Mr. Willan's yard at Appersett, Moore. Sought for there recently without success by Mr. Wheldon.

*Woodsia silvensis* R. Br. Incognit. This species has been met with in Teesdale on the Durham side of the river, and is said to have been gathered by the late Mr. Potter, the fern collector, on Cronkley Scars.

1 *Polypodium vulgare* L. Native. Area general. Range 0-800. Common upon rocks and trees, ascending to the Main Limestone of Micklefell.

3 *P. Phegopteris* L. Native. Montane. Area 9 8 7 4 3 2. Range 0-550. Frequent in damp woods amongst the hills upon both sides of the Central Valley, ascending to Cronkley scars and the Main Limestone cliffs of Punchard's gill. In the Central Vale on Buttercrambe moor.

3 *P. Dryopteris* L. Native. Montane. Area 9 8 7 5 4 3 2. Range 0-700. In similar situations to the preceding, and equally frequent, but not known in the vales. I have seen it clearly within the Upper zone upon the slope of Micklefell towards Lunedale.

4 *Allosorus crispus* Bernh. Native. Montane. Area 9 8 7 3. Range 300-800. Not unfrequent upon the gritstone edges of the western hills. In Teesdale descending to Lonton, ascending to the Main Limestone of Micklefell. In Lunedale upon crags near the Tarn. In Swaledale in Whitstondale and on Raven's Seat moor and the northern slope of Lovely Seat. In the Yore district in several stations; Leyburn moor, Penhill, Great Whernside, &c. On the east upon the sandstone crags of Wainstones.

1 *Cystopteris fragilis* Bernh. including *dentata* and *angustata*. Native. Area 9 8 7 6 3 2. Range 0-800. Frequent upon rocks and walls amongst the hills, especially those of the west and of the Middle Oolite, ascending

to the Main Limestone of Micklefell, and the limestone pavement of Cam-fell and Widdale fell. In the Central Vale on walls at Thornton-le-street.

1 *Aspidium aculeatum* Swartz. Native. Area general. Range 0-800. Common in shaded and rocky places, ascending to the Main Limestone of Micklefell.

2 *A. angulare* Smith. Native. Area 8 7 6 5 4 3 2. Range 0-300. Frequent in similar situations to the preceding throughout the Lower zone.

2 *Lastrea Thelypteris* Presl. Native. Area 6 4 3. Range 0-100. Rare in swampy woods in the low country. Plentiful in Askham bogs and Terrington carr, and on Buttercrambe moor. It grew formerly in Holly hill bogs near Castle Howard, and is reported by Archdeacon Peirson from Danbydale.

1 *L. Oreopteris* Presl. Native. Area 9 8 7 5 4 3 2 1. Range 0-550. Frequent upon heaths, especially amongst the hills, ascending to Cronkley scars.

1 *L. Filix-mas* Presl. Native. Area general. Range 0-800. Common in woods and amongst rocks, ascending to the Main Limestone of Micklefell.

2 *L. spinulosa* Presl. Native. Area 8 6 5 4 3 2 1. Range 0-200. Frequent in the low country woods, especially in the carrs of the Central Valley, ascending to Arncliffe woods near Egton bridge.

1 *L. dilatata* Presl. Native. Area general. Range 0-800. Common in woods and amongst rocks, ascending to the peak of Dodfell, the grit-stone edges of Lovely Seat and the Main Limestone of Micklefell. *L. collina* Neum. has been found by Mr. Mudd in the neighbourhood of Great Ayton.

6 *L. Fæniseeii* Wats. Native. Area 4 3. Range 0-150. In Cock mill woods near Whitby, and in the wood on the east side of the dale of Derwent at Everley near Hackness.

1 *Athyrium Filix-femina* Roth including *rhaticum* and *molle*. Native. Area general. Range 0-550. Common in shaded woods and amongst rocks, ascending to Cronkley and White force scars, and the Main Limestone cliffs of Punchard's gill.

4 *Asplenium viride* Huds. Native. Montane. Area 9 8 7 3. Range 200-800. Frequent amongst the western hills, especially upon the limestone scars. In Teesdale it descends to Lonton, and ascends to the Main Limestone of Micklefell. In Deepdale it grows upon the rocks in the upper part of the glen, and in Lunedale upon the crags in the neighbourhood of the Tarn. In the West Swale district in Whitstondale, Punchard's

gill, and at Keasdon force, and down the dale as far east as Aislabeck near Richmond. Hell gill, and numerous stations in Wensleydale, ascending to the limestone pavement of Widdale fell and Camfell. On the east in two or three of the glens of the Hambleton range near Hawnby.\*

1 *Asplenium Trichomanes* L. Native. Area 9 8 7 5 4 3 2. Range 0-500. Frequent upon walls and rocks, especially amongst the hills, ascending to Blea beck sears and the Main Limestone cliffs of Harlen fell and Booze moor.

1 *A. marinum* L. Native. Maritime. Area 3. Range C.L. Amongst the coast cliffs at Burniston Wyke near Scarbro'.

1 *A. Adiantum-nigrum* L. Native. Area 9 8 7 5 4 3 2 1. Range 0-450. Frequent upon walls and rocks, especially amongst the hills, ascending to the Main Limestone cliffs of Harlen fell.

1 *A. Ruta-muraria* L. Native. Area general. Range 0-650. Frequent upon walls and rocks, ascending to the limestone pavement of Widdale fell.

1 *Scolopendrium vulgare* Sym. Native. Area 9 8 7 6 5 4 3 2. Range 0-450. Frequent in rocky places, especially amongst the hills, ascending to the Main Limestone scars of Copperthwaite moor.

1 *Blechnum boreale* Swartz. Native. Area 9 8 7 5 4 3 2 1. Area 0-850. Common upon heaths, ascending to the peak of Micklefell.

1 *Pteris aquilina* L. Native. Area general. Range 0-600. Frequent in the less cultivated tracts, both in the low country and amongst the hills, up to as high as the upper limit of the Agrarian region. The highest stations in which I have seen it are on the spur of hill on the west of the White Force, and on the gritstone edges over Raven's Seat and Crook Seat.

6 *Hymenophyllum Wilsoni* Hook. Native. Area 3. Range 100-200. Rocks by the side of the stream in the upper part of Farndale, *Mudd! H. Tunbridgensis* is said to have been found by Mr. Peterkin on the banks of the stream which falls into the sea at Hayburn Wyke; and one of the species is reported from a glen near Mickleton. At Eskdale side a Moss was mistaken for the Fern.

1 *Osmunda regalis* L. Native. Area 8 6 4 3 2. Range 0-150. Swampy woods in the low country, rare. In the Central Valley in Newby woods

\* Closely allied to *Allosorus* in its North Yorkshire distribution. Both are frequent ferns throughout the western range of hills, and both occur very sparingly in the east. But whilst the *Asplenium* specially affects the scars of limestone, the *Allosorus* is usually to be met with upon edges of gritstone, either Millstone Grit proper or the bands of Gritstone which are interpolated between the terraced limestones of the Yoredale series.

near Topcliffe and plentiful in Askham bogs. Amongst the eastern hills in several stations; Wheeldale, Walking mill foss, Beck hole (now extinct), Mulgrave woods, Forge valley and Barnescliffe near Scarbro'.

*Onoclea sensibilis* L. Incognit. Formerly subspontaneous in the Ainsty in a lane near Moreby, but now extinct, *Baines*.

1 *Botrychium Lunaria* w. Native. Area general. Range 0-550. Frequent in grassy places and upon heaths, ascending in Teesdale to the banks of Maze beck, in Arkendale to the Copperthwaite leadmines and the peak of Booze moor.

1 *Ophioglossum vulgatum* L. Native. Area 8 7 6 5 4 3 2 1. Range 0-150. Frequent in meadows in the low country.

1 *Lycopodium clavatum* L. Native. Area 9 8 7 5 4 3 2 1. Range 0-850. Frequent upon heaths, ascending from Stockton forest and Strensall common to the peak of Micklefell.

1 *L. inundatum* L. Native. Area 3 2 1. Range 0-100. In many places amongst the swampy heaths of the low country. Pilmoor, Stockton forest, Strensall common, Welburn moor, Terrington carr.

4 *L. alpinum* L. Native. Montane. Area 9 7 5 4 3. Range 200-850. Frequent amongst the higher hills both of the east and west, ascending to the peak of Micklefell, descending to Hutton Bushel moor near Hackness.

1 *L. Selago* L. Native. Montane. Area 9 8 7 5 4 3 1. Range 0-850. Frequent amongst the higher hills, ascending from the vale heaths to the peak of Micklefell.

4 *L. selaginoides* L. Native. Montane. Area 9 8 7 3 2 1. Range 0-750. Frequent in oozy places amongst the western hills, ascending to the springs of the northern slope of Micklefell, descending to Woodhall and the Yore side at Aysgarth force. In the Central Valley on Stockton forest and Strensall common, and in the Howardian tract on Welburn moor and Terrington carr. Amongst the eastern calcareous hills in a few stations; Hambleton End, Whitstoncliff, Hackness moor, Cloughton moor.

1 *Pilularia globulifera* L. Native. Area 8 3 2 1. Range 0-150. Ponds and swamps in the low country in several places. In a brickpond near Leeming Lane, abundant in Gormire, Scarbro' mere, and in several places upon the vale heaths. Reported also from the neighbourhood of Great Ayton.

2 *Equisetum Telmateia* Ehrh. Native. Area 9 8 7 5 4 3 2 1. Range 0-400. Frequent in swampy woods and thickets, ascending to Clough wood in Fossdale and Shaw wood in Arkendale.



3 *Equisetum umbrosum* Willd. Native. Montane. Area 9. Range 250-300. In Teesdale by the streamside from Lower Cronkley bridge as far down as Middleton.

1 *E. arvense* L. Native. Area general. Range 0-550. Common in cultivated fields and waste places, ascending to Hollow mill cross and above the Main Limestone in Punchard's gill.

1 *E. sylvaticum* L. Native. Area general. Range 0-400. Frequent in damp woods and meadows, especially amongst the hills, ascending to the upper part of Coverdale.

1 *E. palustre* L. Native. Area general. Range 0-650. Common in damp places, ascending to the tarn on the end of the hill on the north of Hollow mill cross.

1 *E. limosum* L. including *fluviatile* Fries. Native. Area general. Range 0-600. Common in ponds and slow streams, ascending to the reservoir of a deserted lead working on the plateau of Pin Seat.

3 *E. hyemale* L. Native. Area 8 4 3 2 1. Range 0-200. In the west on the banks of Barnaby beck near Reeth, and by the Swale side at Easby. In the Central Valley at Raskelf, Hazel bush near Strensall and between Topcliffe and Thorpfield. In the east in Goathland dale and Eskdale (Grosmont), at Hackness, Hayburn Wyke, Coneysthorp, Crambeck, and by the Derwent side opposite Kirkham.

3 *E. variegatum* Schl. Native. Montane. Area 9. Range 250-600. In Teesdale ascending to the plateau of Cronkley fell, descending to the Tees side at Middleton. Reported also from the Yore side at Aysgarth force.

SUMMARY. In this chapter 42 species are included, all of which are Natives. 40 are plants of the Lower, 29 of the Middle, and 15 of the Upper zone; and they range under the types of distribution as follows, viz.; British 25, English 6, Scottish 5, Highland 4, Atlantic 2.

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#### TOTAL SUMMARY OF THE FLOWERING PLANTS AND FERNS.

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Classifying the plants of North Yorkshire according to their categories of citizenship as in the list now completed, we obtain the following result;

Natives, .. ..	872
Colonists, .. ..	84
Denizens, .. ..	36
Aliens, .. ..	163

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1155

Of the 992 species of the three higher grades of citizenship 948 are ascertained as plants of the Lower, 413 of the Middle, and 126 of the Upper zone. A more detailed classification of the species according to their altitudinal range will be found at page 188: and an attempt at a classification of the Native species according to the plan of their distribution in North Yorkshire will be found at page 91. Arranging the 992 species according to the "types of distribution," with regard to Britain as a whole (see page 190), under which they fall, we obtain the following result;

British	type,	..	..	..	526 species.
English	"	..	..	..	301 "
Scottish	"	..	..	..	44 "
Highland	"	..	..	..	32 "
Germanic	"	..	..	..	38 "
Atlantic	"	..	..	..	7 "
Intermediate	..	..	..	..	33 "
Local	"	..	..	..	11 "
TOTAL ..					992

## CHAPTER XXII.

### MOSES.

Amongst the Mosses a much larger proportion of the species have the Montane role of distribution than is the case amongst the plants of the higher orders, whilst on the other hand the Xerophilous and Maritime species are very few in number. Wilson's "*Bryologia Britannica*" has been followed as a standard of classification and nomenclature. For an explanation of the meaning of the letters A, B, and C, when they follow the word "Montane," the reader must refer to page 56, where he will find our Montane Flowering Plants and Ferns separated into three classes, marked A, B, and C respectively. If the lists there given had been extended so as to include the Mosses, the species now distinguished as indicated would have been placed side by side with their geographical analogues amongst the plants of the higher orders, and it might be worth while for anyone who is interested in the subject thus to extend those lists, and those of the Xerophilous and Subxerophilous species, for himself. The *Cybele Britannica* does not include the Mosses. Their distribution throughout Britain is much less thoroughly known than is that of the Flowering Plants and Ferns, and I have not therefore attempted to refer the species to their "types of distribution," neither have I attempted to trace them through the nine drainage districts, and their ascertained vertical range is stated by means of the Climatic zones, not in leaps of fifty yards. In denoting the zones by numbers I have begun from below, so that "Range 1-2" means that the species has been observed in the Lower and Middle, but not in the Upper zone. And lastly, no category of citizenship is stated, because no species can be considered as introduced by human agency. All that we can safely claim at all, we may, without risk of blunder, regard as "Natives."

*Andræa alpina* Hedw. Montane A. Range 2-3. In tolerable plenty upon most of the higher scars in Upper Teesdale.

*A. rupestris* Hedw. Montane A. Range 2-3. Plentiful throughout Upper Teesdale from Micklefell to Lonton, especially upon damp arenaceous rocks. Upon the gritstone edges over Lunedale Tarn, and of Nine Standards, Raven's Seat moor, and Lovely Seat.

*A. Rothii* W. & M. Montane B. Range 1-3. Plentiful with the preceding in Upper Teesdale and Lunedale. Upon the Coverdale slope of Great Whernside. On the east on the freestone crags of Lounsedale, Baysdale and Ingleby moor.

*Sphagnum cymbifolium* Ehrh. Range 1-3. Common upon swampy heaths, ascending from the Central Valley to the peak of Micklefell.

*S. compactum* Brid. Range 1-2. Not unfrequent upon damp moors. Addleburgh, Pilmoor, Stockton forest, Ayton moor, Sleights moor, the Hambleton hills, Easterside, Terrington carr, &c.

*S. molluscum* Bruch. Range 1-3. Rare upon damp moors. In Swaledale upon the southern spur of Rogan's Seat. In the Central Vale on Stockton forest, *Spruce*. In Cleveland on Guisbro' moor, in fruit, *Mudd*!

*S. acutifolium* Ehrh. Range 1-3. Common upon damp heaths, ascending from the Central Valley to the peak of Micklefell.

*S. rubellum* Wils. Range 2. Boggy open space nearly south-west from the High force inn, on the Yorkshire side of the river, plentiful, *Wilson*. It has been found also near the Caldron Snout by Mr. Slater.

*S. fimbriatum* Wils. Range 1-2. Damp moors, rare. On the west in the Black plantation near Richmond, *Ward*! In the Central Vale on Towthorpe moor, *Spruce*! On the east in Kildale, Flazendale, and near Higheliffe.

*S. cuspidatum* Ehrh. Range 1-3. Common in turf bogs and upon swampy heaths, ascending from the Central Valley to the peak of Micklefell.

*S. contortum* Schultz including *S. subsecundum* Nees. Range 1-2. Frequent upon swampy moors, ascending from the vale heaths to the plateau of Holwick fell. *S. laricinum* *Spruce*! from Terrington carr is placed by Wilson under this species.

*S. squarrosum* Pers. Range 1-2. Frequent on swampy heaths both in the low country and amongst the hills.

*Archidium phascoides* Bridel. Range 1. In the Central Vale in damp sandy ground on Pilmoor and Stockton forest.

*Phascum serratum* Schreb. Range 1. Frequent on sandy ground in the low country.

*Phascum muticum* Schreb. Range 1. Banks between Aske and Richmond, *Ward!*

*P. Floerkeanum* W. & M. Range 1. In the Howardian tract, in fallow ground at Bulmer and Castle Howard, *Spruce.*

*P. rectum* Sm. Range 1. In the Central Vale on a bank between York and Skelton, *Spruce.*

*P. cuspidatum* Schreb. Range 1-2. Frequent in waste ground both in the low country and amongst the hills.

*P. bryoides* Dicks. Range 1. In the Howardian tract in waste ground at Ganthorpe and quarries at Welburn, *Spruce.*

*P. patens* Hedw. Range 1. In the Central Vale in ditches near the Foss at York; and in the Howardian tract at Temple Rush near Castle Howard, *Spruce.*

*P. nitidum* Hedw. Range 1. Waste ground, rare. Aislabeck near Richmond, *Ward!* In Cleveland on clay banks at Great Ayton, *Mudd!*

*P. subulatum* L. Range 1-2. Frequent upon sandy banks both in the low country and amongst the hills.

*P. alternifolium* B. & S. Range 1. In the Central Vale frequent about York in similar situations to the preceding, and in the Howardian tract at Welburn and elsewhere, *Spruce!*

*P. crispum* Hedw. Range 1. In Cleveland in fields at Great Ayton, *Mudd!*

*Gymnostomum tenue* Schreb. Range 1. On shaded arenaceous rocks and in sandy ground in several places. Richmond, Thorp Arch, Thirsk, Sutton Bank, Castle Howard, &c.

*G. rupestre* Schwaegr. Montane B. Range 1-2. Frequent on dripping rocks in all the three dales of the west. In Teesdale both upon the high scars and by the streamside. In Gretaedale at the falls below Sleightholme. Whitstondale scars and in most of the glens of the Yore district. On the east on Ingleby bank and in a glen called Hell gill on Guisbro' moor, *Mudd!*

*G. curvirostrum* Hedw. Montane B. Range 1-2. In similar situations, and with a similar range to the preceding. Teesdale, Punchard's gill, very fine at Keasdon force and in the lower part of East Stonesdale, Har-draw force, &c. On the east found by Mr. Spruce in the upper part of Newtondale.

*G. microstomum* Hedw. Montane B. Range 1-2. In Teesdale on Cronkley scars, *Black.* Near Richmond in the west field, *Ward.* In the Howardian tract near Ganthorpe, *Spruce.*

*Weissia controversa* Hedw. Range 1-2. Common upon banks both in the low country and amongst the hills.

*W. cirrhata* Hedw. Montane C. Range 1-2. Frequent amongst the hills on both sides of the Central Valley, more especially upon arenaceous rocks, and occasionally upon trees and palings in the low country.

*W. verticillata* Brid. Montane C. Range 1-2. Frequent upon dripping rocks and in swamps, especially amongst the hills, ascending from the Central Valley to the western slope of Mickelfell and the plateau of Cronkley fell.

*Campylostelium saxicola* B. & S. Montane B. Range 1. Rare upon shaded arenaceous rocks in the east. Merrick's gill near Hackness, *Spruce*. Forge valley, *Black*!

*Brachyodus trichodes* N. & H. Montane B. Range 1. Upon the arenaceous rocks of the eastern hills, both in Cleveland and upon the western and southern slope of the Hambleton range in numerous stations. In the Howardian tract plentiful in the sandstone quarry in Castle Howard Park.

*Seligeria pusilla* B. & S. Montane B. Subxerophilous. Range 1. Shaded rocks in the east, especially of limestone, rare. Near Scarbro' at Forge valley and in Raincliffe wood, *Black*! Banks of Goathland beck, *Braithwaite*. In the Howardian tract in Mowthorpe dale and near Crambeck, *Spruce*!

*S. recurvata* B. & S. Montane B. Range 1-2. Frequent upon shaded rocks amongst the hills on both sides of the Central Valley, ascending in Arkendale to the upper part of Punchard's gill.

*Anodus Donianus* B. & S. Montane B. Range 1-2. Shaded rocks amongst both ranges of hills, rare. In Teesdale near the river at the High force and Winch bridge. Slopes of the Hambleton range at Oldstead and below Rolston scarr. In the Howardian tract in Mowthorpe dale and near Crambeck.

*Blindia acuta* B. & S. Montane B. Range 2. Dripping rocks of most of the Teesdale scars from Maze beck eastward to Crossthwaite beck near Lonton. Whitstondale cliffs and at the waterfall in Punchard's gill. In Cleveland found by Mr. Mudd on Ingleby bank. Similar in its North Yorkshire distribution to *Gymnostomum curvirostrum* and *rupestre*, and many other mosses, and of the Flowering Plants and Ferns to *Hieracium crocatum*, *Carduus heterophyllus* and *Allosorus*.

*Cynodontium Bruntoni* B. and S. Montane B. Range 1-2. Upon most of the Teesdale scars from Cronkley fell eastward to Crossthwaite beck. In Deepdale upon the gritstone crags of Cat castle. On the east found by Mr. Spruce on rocks near the head of Newtondale.

*Dicranum pellucidum* Hedw. with *D. flavescens* Smith. Range 1-3. Common upon damp rocks and by the side of streams, ascending to the Main Limestone of Micklefell.

*D. squarrosum* Schrad. Montane B. Range 1-2. Frequent in swamps and upon dripping rocks amongst the hills, ascending to Hollow mill cross and the plateau of Pin Seat.

*D. Schreberi* Hedw. Range 1. In the Howardian tract in a ditch on the west side of the Temple Rush, *Spruce*.

*D. varium* Hedw. Range 1-2. Everywhere common upon fallows and clayey banks, ascending to the plateau of Pin Seat.

*D. rufescens* Turn. Range 1-2. In similar situations to the preceding, as a form of which it is doubtless often overlooked. In Teesdale by the streamside near Winch bridge, *Black*. Banks of Whitstondale beck near its junction with the Swale. In Cleveland on the slope of Kildale moor, *Mudd*! On the banks of Cock mill beck near Whitby, *Braithwaite*. In the Howardian tract in the park quarry, *Spruce*.

*D. cerviculatum* Hedw. Range 1-2. Frequent in heathery ground both in the low country and amongst the hills.

*D. heteromallum* Hedw. Range 1-2. Common in damp sandy and heathy ground, especially amongst the hills.

*D. Blyttii* B. and S. Montane A. Range 2. In Teesdale on basaltic debris at the base of Holwick scars, *Spruce*.

*D. falcatum* Hedw. Montane A. Range 2. In Teesdale at the upper part of Cronkley scars, *Black*. The plant given under this name in Suppl. Flo. Yorks. is *D. heteromallum*.

*D. fuscescens* Turn. Montane B. Range 1-3. Frequent upon the arenaceous crags of both the eastern and western ranges of hill, ascending to the Upper zone on Micklefell.

*D. scoparium* Hedw. Range 1-3. Common in woods and amongst rocks and upon heaths from the low country upwards to the peak of Micklefell.

*D. palustre* Brid. Range 1-2. Frequent upon damp heaths, ascending from Pilmoor and Stockton forest to the plateau of Pin Seat.

*D. spurium* Hedw. Range 1. Damp heaths of the low country, locally plentiful. In the Central Vale on Pilmoor, Stockton forest and Strensall common. In the Howardian tract on Coulton moor.

*D. majus* Turn. Range 1-2. Frequent in woods and amongst rocks, especially amongst the hills.

*Leucobryum glaucum* B. and S. Range 1-3. Common upon swampy heaths, ascending from the Central Valley to the Upper zone peaks.

*Ceratodon purpureus* Brid. Range 1-3. Common upon heaths, especially in places where the heather has been burnt, ascending from the Central Vale to the Upper zone peaks.

*C. cylindricus* B. and S. Range 1. In the Central Vale on Stockton forest, and in the Howardian tract on old charcoal stools in Castle Howard woods, *Spruce*.

*Campylopus torfaceus* B. and S. Range 1-2. Frequent in turfy woods, especially amongst the hills.

*C. flexuosus* Brid. Range 1-2. Common upon damp heaths. I have not seen *C. longipilus* within our limits, but it grows upon the Westmoreland side of Maze beck.

*C. brevipilus* B. and S. Range 1. In the Central Vale on Strehsall common upon the side nearest Flaxton, *Wilson*! Discovered there in 1856, and only known in a single British station previously.

*Pottia cavifolia* Ehrh. Range 1-2. Frequent upon roofs, fallows and earthy banks.

*P. minutula* B. and S. Range 1. Occasionally in similar situations to the preceding. Thirsk, York, Thorp Arch, Castle Howard, &c.

*P. truncata* B. and S. Range 1-2. Common in similar situations to the two preceding.

*P. Heimii* B. and S. Range 1. In the salt-marshes at Middlesbro' and Coatham, and on both sides of the Esk at Whitby. Inland found by Mr. Spruce on the multangular tower at York, and on the bridge over the Wharfe at Thorp Arch.

*Anacalypta Starkeana* N. and H. Range 1. In the Central Vale on banks at Clifton Scope near York, *Spruce*.

*A. lanceolata* Rohl. Range 1. Not unfrequent on earthy banks in the low country. Richmond, Leckby, York, Great Ayton, Lofthouse, Dalby, Castle Howard, &c.

*Distichium capillaceum* B. and S. Montane B. Range 1-3. Damp rocks amongst the hills. Frequent in Teesdale, ascending from the river side at Eglestone abbey to the Main Limestone of Micklefell. In Swaledale at Keasdon force, and in Wensleydale at Aysgarth force, and on the Main Limestone rocks of Ten end. On the east in Cleveland on Ayton moor, *Mudd*; the rocks of Kirkby bank, *Dalton junr.*; and the banks of Saltersgate beck, *Slater*.

*Didymodon rubellus* B. and S. Range 1-3. Common upon rocks and hedgebanks, ascending from the low country to the limestone scars of the northern slope of Micklefell, and the limestone pavement of Camfell.



*Didymodon cylindricus* B. and S. Range 1. In Eskdale on stones in Lythe beck near Grosmont, *Spruce*.

*D. flexifolius* H. and T. Montane B. Range 1-2. In Cleveland in turfy places on Ayton moor, *Mudd*! Common upon the moors at the head of Bilsdale, *Dalton junr.* Moor above the Foss reservoirs.

*Trichostomum crispulum* Bruch. Maritime. Range 1. Amongst the coast cliffs north of the mill at Scalby near Scarbro', *Spruce*!

*T. mutabile* Bruch. Maritime. Range 1. With the preceding on the coast cliffs at Scalby, *Spruce*.

*T. tophaceum* Brid. Range 1. In Cleveland amongst the coast sandhills near Redcar, *Mudd*! and in Lofthouse woods, *Braithwaite*. In the Howardian tract on dripping rocks at Crambeck, *Spruce*! Raincliffe wood near Scarbro', *Black*!

*T. rigidulum* Smith. Range 1-3. Common upon walls and rocks both in the low country and amongst the hills, ascending to the Main Limestone scars of Micklefell.

*T. tortile* Schwaegr. Range 1. In the Howardian tract with *Brachyodus trichodes* in the sandstone quarry in Castle Howard park.

*T. flexicaule* B. and S. Montane B. Xerophilous. Range 1-3. This species, *Tortula tortuosa* and *Neckera crispa*, are amongst the Mosses what *Scabiosa Columbaria*, *Poterium Sanguisorba* and *Carlina vulgaris* are amongst the Flowering Plants, species distributed throughout the dysgeogenous tracts, and often growing there plentifully, but otherwise quite rare. These three Mosses furnish typical illustrations of what I have called the Xerophilous role of distribution. This species is common upon dry banks amongst the calcareous hills upon both sides of the Central Valley. It grows upon the Magnesian Limestone in various places, and ascends on the west to the Main Limestone of Micklefell, and the limestone pavement of Camfell and Widdale fell, and on the east to the plateau of Hambleton End. I know of only one station amongst the eastern arenaceous hills, the summit of Cold moor, at the head of Bilsdale.

*T. homomallum* B. and S. Range 1. Frequent in damp sandy ground and upon shaded arenaceous rocks, especially amongst the hills.

*Tortula rigida* Schults. Range 1. In the Central Vale on clay banks at Hob moor near York, *Ibbotson*! Mud-capped walls on the east along the Middle Oolite in several places; Hovingham, Malton, Crambeck, Scalby, &c.

*T. ambigua* B. and S. Range 1. Mud-capped walls along the Middle Oolite in several places; Welburn, Malton, Kirby-moorside, Hutton in the hole, &c.

*Tortula aloides* B. and S. Range 1. Clay banks near Masham, Mudd. Barn-roof near Thirsk. Calcareous gritstone rocks near the summit of Wass bank and Hood hill. Plentiful in several places on mud-capped walls from Byland abbey eastward along the Middle Oolite.

*T. unguiculata* Hedw. Range 1-2. Frequent upon hedgebanks and rocks, both in the low country and amongst the hills.

*T. fallax* Hedw. Range 1-3. Common upon earthy banks, ascending from the low country to the limestone pavement of Camfell.

*T. vinealis* Brid. Range 1. Frequent upon sandy banks and sandy rocks in the Lower zone.

*T. tortuosa* W. and M. Montane B. Xerophilous. Range 1-3. See remarks under *Trichostomum flexicaule*. Common upon calcareous rocks upon both sides of the Central Valley, ascending from the Magnesian Limestone to the limestone pavement of Camfell and Widdale fell. Upon the gritstone in Punchard's gill. Amongst the eastern arenaceous hills at Ingleby bank, on the slope of Black moor and over Newtondale.

*T. convoluta* Hedw. Range 1-2. Common in stony and turfy places both in the low country and amongst the hills.

*T. muralis* Hedw. Range 1-2. Everywhere common on walls and rocks.

*T. marginata* B. and S. Range 1. In the Central Vale in sandy ground at Leckby. On the slope of the Hambleton hills on rocks below Whitston-cliff and Rolston scar, and over Oldstead. In the Howardian tract in the sandstone quarry in Castle Howard park.

*T. subulata* Brid. Range 1-2. Common upon shaded banks, ascending to the Main Limestone scars of Punchard's gill.

*T. latifolia* B. and S. Range 1. Frequent by the side of streams in the low country. Banks of the Swale, Wiske, Yore, Wharfe, Ouse, Cod-beck, Esk and Derwent.

*T. lævipila* Brid. Range 1. Frequent upon trees and sometimes also upon walls in the low country.

*T. ruralis* Hedw. Range 1-3. Common upon roofs and sandy banks, ascending from the coast sandhills to the limestone pavement of Camfell.

*T. papillosa* Wils. Range 1. On trees, found by Mr. J. H. Davies on willow and hawthorn at Thirsk, by Mr. Spruce on elms at Huntington, and by Mr. Nowell on thorns near the Mere at Scarbro'.

*Cinclidotus fontinaloides* Beauv. Montane C. Range 1-2. Plentiful in the streams of the western dales where they break through the limestone, ascending to the plateau of Holwick fell, descending with the Swale

to Aisenby and the Yore to Ripon. On the east found by Mr. Mudd in Hell gill, Guisbro' moor.

*Encalypta vulgaris Hedw.* Range 1-2. Frequent upon walls and dry banks, especially amongst the hills.

*E. ciliata Hedw.* Montane A. Range 2-3. Upon most of the Teesdale cliffs, ascending to the Main Limestone of Micklefell, descending to the Tees side below Holwick. In the Yore district upon the scars of Mossdale, Addleburgh and Waldendale.

*E. streptocarpa Hedw.* Montane B. Subxerophilous. Range 1-3. Frequent upon walls and in the crevices of rocks amongst the limestone hills on both sides of the Central Valley, ascending to the limestone pavement of Widdale fell, and the limestone edges of the northern slope of Micklefell. Occasionally upon the Gritstone, Lias and Lower Oolite as at Boltby and Huthwaite, and in Stogdale and Westerdale.

*Hedwigia ciliata Hedw.* Montane B. Range 1-2. In Teesdale on the scars from Cronkley eastward to Lonton. Amongst the eastern arenaceous hills on rocks and walls in several places; Lounsedale, Houlisike in Eskdale, Ladhill gill, Osmotherley, and on the basaltic ridge over Great Ayton.

*Schistidium apocarpum B. and S.* Range 1-3. Common upon walls and rocks, ascending from the Central Valley to the Main Limestone of Micklefell, Camfell and Widdale fell. The *var. rivulare* is frequent in streams.

*S. maritimum B. and S.* Maritime. Range 1. Found upon the coast cliffs by Mr. Mudd at Huntcliffe, and by Dr. Black near the Spa at Scarbro'.

*Grimmia pulvinata Smith.* Range 1-3. Common upon rocks and walls, ascending from the Central Valley to the Upper zone peaks.

*G. spiralis H. and T.* Montane A. Range 2. In Teesdale at the White force, and by the streamside on rocks near the High force.

*G. torta Hornsch.* Montane A. Range 2. In Teesdale on Cronkley and Holwick scars, and by the streamside from Maze beck falls eastward to High force.

*G. trichophylla Grev.* Montane B. Range 1-2. Frequent upon arenaceous rocks and walls amongst the hills on both sides of the Central Valley.

*G. Doniana Smith.* Montane A. Range 3. In Teesdale on walls on the plateau of Cronkley fell.

*Racomitrium aciculare Brid.* Montane B. Range 1-3. Frequent upon damp rocks and in streams amongst the hills, ascending to the Main Limestone of Micklefell.

*Racomitrium protensum* Braun. Montane A. Range 2. Frequent upon dripping rocks on most of the scars of Upper Teesdale from the Maze beck falls eastward. In Swaledale by the river side above Keld. In Arkendale at the waterfall in Punchard's gill.

*R. fasciculare* Brid. Montane B. Range 1-3. Frequent on walls and rocks amongst the hills, ascending to the Main Limestone of Mickelfell.

*R. heterostichum* Brid. Montane B. Range 1-3. In similar situations to the preceding, with which it is often associated, and with the same vertical range.

*R. lanuginosum* Brid. Range 1-3. Common upon heaths and rocks, ascending from the vale heaths to the Upper zone peaks.

*R. canescens* Brid. Range 1-3. Frequent upon heaths, ascending from Stockton forest to the Upper zone peaks.

*Ptychomitrium polyphyllum* B. and S. Montane C. Range 1. Walls and rocks of sandstone, rare. In the Central Vale on stones at Thornton-le-street. Amongst the eastern hills in Bilsdale and on the Newton side of Roseberry Topping.

*Orthotrichum cupulatum* Hoffm. Range 1-3. Frequent upon walls and stones, ascending from the Central Valley to the Main Limestone of Mickelfell.

*O. anomalum* Angl. *O. neglectum* Schimp. Range 1-2. Frequent in similar situations to the preceding, ascending to the plateau of Cronkley fell.

*O. pumilum* Dicks. Range 1. On trees, found by Mr. Brunton on sycamore near Ripon, by Mr. Spruce on ash at Clifton Ings near York, and the Rev. J. Dalton, junr., at Ingleby Greenhow.

*O. tenellum* Bruch. Range 1. On trees and bushes in hedgerows in several places. Muker, Thirsk, Sutton-under-Whitstoncliff, Guisbro', Castle Howard, &c.

*O. pallens* Bruch. Range 1. Found by Mr. Spruce in company with *O. Sprucei* on a willow at Clifton Ings near York. I have gathered the species just beyond our limits on trees on the south side of the Yore near Tanfield.

*O. stramineum* Hornsch. Range 1-2. Not unfrequent on trees and bushes in hedgerows both in the low country and amongst the hills.

*O. affine* Schrad. Range 1-2. Frequent upon trees and occasionally upon walls in the low country and amongst the hills. *O. fastigiatum* Bruch, which according to Dr. Carrington is a variety of *affine*, occurs occasionally, and the *var. rivale* of Carrington I have gathered upon an alder by the stream at Laskill bridge in Bilsdale.

*Orthotrichum rupestre* Schleich. Montane A. Range 2. On stones in the bed of the Tees below the High Force.

*O. Lyellii* H. and T. Range 1-2. Frequent upon trees, especially amongst the hills.

*O. rivulare* Turn. Range 1. On trees and stones in and about streams in the low country. Stones in the Balder at Cotherstone, *Spruce*. In the Central Valley plentiful along the lower part of the course of Codbeck and near the Swale at Topcliffe. In Eskdale at Castleton and Egton bridge. *O. obtusifolium* has been found by Mr. Wilson near the Ouse at York, a short distance beyond our limits.

*O. Sprucei* Mont. Range 1. Frequent on trees by the side of streams in the low country, often associated with *Tortula latifolia*. Banks of Swale, Yore, Ouse, Wharfe, Wiske, Codbeck, Esk, &c.

*O. diaphanum* Schrad. Range 1-2. Frequent upon trees and bushes, and occasionally upon walls and rocks in the low country and amongst the hills.

*O. leiocarpum* B. and S. Range 1-2. Frequent upon trees and walls in the low country and amongst the hills.

*O. pulchellum* Smith. Range 1-2. Frequent upon trees and bushes, especially amongst the hills.

*O. Bruchii* Brid. Range 1-2. Frequent upon trees, especially amongst the hills, ascending to the trees which grow upon the higher Main Limestone scars.

*O. crispum* Hedw. Range 1-2. In similar situations to the preceding, but less frequent. *O. crispulum* Hornsch. has been gathered by Dr. Black in Forge valley.

*O. Drummondii* H. and G. Montane B. Range 1-2. Plentiful on trees in Upper Teesdale, in the West Swale district in Whitstondale and Punchard's gill, in the Yore district in Widdale, Whitfell gill and Coverdale. In the east it has been gathered by Mr. Spruce in Lowdale woods near Hackness, and by myself near the head of Danbydale.

*O. Hutchinsiae* Smith. Montane B. Range 1-2. Rocks amongst the hills, rare; gathered by Mr. Borrer near Rokeby, by Mr. Spruce on the Hambleton plateau between Scawton and Hambleton house, and by myself on Kewick moor.

*O. phyllanthum* B. and S. Range 1. In Cleveland plentiful on trees in Ingleby park, *Mudd!* Forge valley, *Black!* On thorns at Cayton Bay near Scarbro', *Nowell!*

*Zygodon Mougeotii* B. and S. Montane B. Range 1-2. Rocks of most

of the Teesdale scars from the falls of Maze beck eastward to Lonton. In the West Swale district in Whitstondale, East Stonesdale, Cliff gill, Punchard's gill and at Keasdon force. In Wensleydale in the glen above Hardraw force. Amongst the eastern hills found by Mr. Mudd near Battersby and by Mr. Spruce near Egton bridge. *Z. Lapponicus* is a moss of the Durham portion of Teesdale.

*Zygodon viridissimum* Brid. Range 1-2. Frequent on trees and bushes and occasionally upon stones in the low country and amongst the hills.

*Z. conoideus* H. and T. Range 1. In Cleveland on trees in Ingleby park, Mudd!

*Tetraphis pellucida* Hedw. Montane B. Range 1-2. Frequent upon shaded rocks amongst the hills on both sides of the Central Valley.

*Tetradontium Brownianum* Schwaegr. Montane B. Range 1-2. Frequent upon shaded rocks, especially of sandstone, amongst both ranges of hill.

*Diphyscium foliosum* W. and M. Montane B. Range 1-2. Damp rocks, rare. In Teesdale on Holwick scars, and by the streamside at the falls of Maze beck and High Force. On the east found by Mr. Mudd in Lonsdale.

*Atrichum undulatum* Beauv. Range 1-2. Common in shaded places in the low country and amongst the hills.

*Oligotrichum hercynicum* D.C. Montane A. Range 2-3. On the peak of Great Whernside, and also on the Coverdale slope of the hill at an elevation of about 1500 feet.

*Pogonatum nanum* Brid. Range 1-2. Frequent upon shaded banks, especially amongst the hills.

*P. aloides* Brid. Range 1-2. Frequent in similar situations to the preceding.

*P. urnigerum* Brid. Range 1-3. Frequent upon shaded banks and heaths from the Central Valley upwards to the plateau of Pin Seat.

*P. alpinum* Brid. Montane B. Range 2-3. In numerous stations amongst the western moors, ascending to the peaks of Micklefell, Great Whernside and Lovely Seat. On the east on Ayton moor and near the head of Flazendale, and reported by Teesdale from the east side of Ray wood near Castle Howard.

*Polytrichum gracile* Menzies. Montane B. Range 1. Abundant in the bog called Fen bog by the side of the railway at the upper part of Newtondale.

*P. formosum* Hedw. Range 1-2. Frequent upon heaths, especially amongst the hills.

*Polytrichum commune* L. Range 1-3. Everywhere common upon heaths and uncultivated pieces of ground, ascending from the Central Valley to the Upper zone peaks. I have gathered *P. fastigiatum* Wilson on the moor near the side of the road on the slope of Easterside towards Bilsdale.

*P. juniperinum* Hedw. Range 1-3. Common upon heaths, ascending from the Central Valley to the Upper zone peaks. The var. *P. alpestre* Hoppe is frequent amongst the higher hills.

*P. piliferum* Schreb. Range 1-2. Frequent in similar situations to the preceding, ascending to the plateau of Pin Seat.

*Aulacomnion palustre* Schwaegr. Range 1-3. Common in swampy places, ascending from the carrs and heaths of the Central Valley to the Upper zone peaks.

*A. androgynum* Schwaegr. Range 1-2. In Teesdale on rocks below the High Force, Spruce. Tanfield, R. B. Bowman. In the Central Valley on tree stumps in Leckby carr. In Cleveland near Ayton, Mudd, and plentiful at the Wainstones, Dalton junr.

*Leptobryum pyriforme* Wils. Range 1. About the Magnesian Limestone on the bridge and in the quarry at Thorp Arch. In the Central Valley on walls and in sandy ground at Hutton Conyers, Kilvington, Thirsk, Heworth, Haxby, &c. In Cleveland on walls at Ayton, Mudd! Rocks at Hawnby and Helmsley, Teesdale.

*Bryum acuminatum* B. and S. Montane A. Range 2. In Teesdale sparingly on rocks at the west end of Holwick scar, Spruce.

*B. polymorphum* B. and S. Montane A. Range 3. Found by myself in 1856, upon Main Limestone rocks of the Micklefell ridge.

*B. elongatum* Dicks. Montane A. Range 2. In Wensleydale upon the limestone crags of Addleburgh, Ward.

*B. erudum* Schreb. Montane B. Range 1-2. Plentiful upon most of the Teesdale cliffs from the falls of Maze beck as far down the river as Middleton. In the West Swale district near the river above the Hoggarth's smelting mill near Keld. In the Yore district at Mossdale head, Brunton. In Cleveland on the summit of Cold moor at the head of Bilsdale, Dalton junr.

*B. nutans* Schreb. Range 1-3. Common upon heaths, ascending from the Central Valley to the Upper zone peaks.

*B. annotinum* Hedw. Range 1. In the Central Valley on Stockton forest and other places amongst the sandy heaths.

*B. carneum* L. Range 1-2. Frequent upon streamsides and clay banks in the low country and amongst the hills.

*Bryum Wahlenbergii* Schwaegr. Montane C. Range 1-3. Frequent in damp places, especially on dripping rocks amongst the hills, ascending from the Central Valley to the Main Limestone of Micklefell.

*B. ventricosum* Dicks. Montane C. Range 1-3. Frequent upon damp heaths, ascending from Stockton forest and Pilmoor to the Upper zone peaks.

*B. alpinum* L. Montane A. Range 1-2. Frequent upon dripping rocks in Teesdale from the falls of Maze beck eastward to Lonton. In Yoredale at the waterfalls in Skell gill near Askrigg.

*B. pallens* Swartz. Montane C. Range 1-3. Frequent in damp places amongst the hills, ascending from the peaks of the Central Valley to the Upper zone.

*B. turbinatum* Swartz. Range 1. In the Howardian tract by the side of the stream below the new river bridge at Castle Howard, 1854, Wilson!

*B. uliginosum* B. and S. Range 1. Amongst the coast cliffs at Scalby and the coast banks between Whitby and Sandsend. Inland by the Yore side west of Tanfield and in a swamp in the lower part of Newtondale.

*B. pallescens* Schwaegr. Montane A. Range 1-2. In Teesdale on the slope of Micklefell towards Maze beck, and on rocks and sandy deposits near the stream at Winch bridge. In Swaledale by the river side above Keld, and about the Yore on the Magnesian Limestone rocks at Tanfield.

*B. cernuum* B. and S. Range 1-2. Upon walls in several places, especially amongst the hills. Upper Teesdale, Cotherstone, High Startforth, Greta bridge, Middleham, Tanfield, York, Osmotherley, Castle Howard, &c.

*B. inclinatum* B. and S. Range 1-3. Frequent upon walls and banks, ascending from the Central Valley to the Main Limestone cliffs of Micklefell.

*B. intermedium* Brid. Range 1-2. Frequent on walls and in sandy ground in the low country and amongst the hills.

*B. torquescens* B. and S. Range 1. Near Gormire on a rock on the east side of the lake, Borrer.

*B. obconicum* Hornsch. Range 1. At the bottom of Deepdale on a bank by the side of the high road between Barnard Castle and Lartington, Spruce. Greta bridge, Borrer. In the Central Valley plentiful on hedgebanks by the side of the great North road opposite South Kilvington. Sandstone quarries at Osmotherley and Castle Howard. Rainton heights near Hawnby, Davies.

*B. capillare* Hedw. Range 1-3. Common upon banks and rocks from



the Central Valley upwards to the Main Limestone of Camfell and Micklefell.

*Bryum caspiticium* L. Range 1-2. Common upon walls and banks in the low country and amongst the hills.

*B. sanguineum* Brid. Range 1. In the Central Valley found by Mr. Spruce on Stockton forest.

*B. atropurpureum* W. and M. Range 1-2. Frequent upon walls and banks from the Central Valley upwards to the plateau of Holwick fell, often associated with *B. argenteum*. *B. cavifolium* and *B. gracilentum* Taylor in Suppl. Flo. Yorks. are placed by Wilson under this species.

*B. julaceum* Smith. Montane A. Range 2-3. In Teesdale upon the Main Limestone of Micklefell and the scars of Blea beck and Crossthwaite beck.

*B. argenteum* L. Range 1-3. Common upon roofs and walls, ascending from the Central Valley to the limestone pavement of Camfell.

*B. Zierii* Dicks. Montane B. Range 1-3. Frequent upon most of the Teesdale scars, ascending to the Main Limestone of Micklefell, descending to the Tees side at Winch bridge. In Arkendale at Punchard's gill. In the Yore district in Widdale, Mossdale, Waldendale, Coverdale, and on the scars of Addleburgh. On the east found by Mr. Mudd on Ingleby bank.

*B. roseum* Schreb. Montane B. Range 1-2. Frequent on damp rocks and in woods amongst the hills.

*Mnium affine* Bland. Range 1-2. Frequent in damp places both in the low country and amongst the hills.

*M. cuspidatum* Hedw. Montane B. Range 1-2. Rocks amongst the hills in several places. Deepdale, Rokeby park, Keasdon scars, and on both the southern and western slope of the Hambleton hills.

*M. rostratum* Schwaegr. Range 1-3. Common in shaded places, ascending from the Central Valley to the limestone pavement of Camfell.

*M. orthorhyncum* Brid. Montane B. Range 1. Found by Mr. Spruce in the Howardian tract on shaded rocks in Mowthorpe dale, in company with *M. stellare*.

*M. serratum* Brid. Montane B. Range 1-3. Frequent on shaded rocks amongst both ranges of hill, ascending from Cock mill woods near Whitby to the Main Limestone cliffs of Widdale fell.

*M. hornum* Hedw. Range 1-3. Everywhere common in shaded places, ascending from the Central Valley to the Upper zone peaks.

*M. undulatum* Hedw. Range 1-3. Common in similar situations to

the preceding, ascending from the Central Valley to the Main Limestone of Camfell and Micklefell.

*Mnium stellare* Hedw. Montane B. Range 1. Shaded rocks amongst the eastern hills. Baysdale, Goathland dale, Flazendale, Bilsdale, and in the Howardian tract in Mowthorpe dale and Gilla-leys wood.

*M. punctatum* Hedw. Range 1-3. Common by streamsides and on damp rocks, ascending from the Central Valley to the Main Limestone of Micklefell.

*M. subglobosum* B. and S. Montane B. Range 1-2. In swampy places amongst both ranges of hill. Lunedale Tarn, Widdale, Codhill bog, Kirkby bank, Goathland dale, Gurtof gill, Brantsdale, Danbydale, &c.

*Mielichhoferia nitida* N. and H. Montane B. Range 2. Found recently by Mr. Mudd in Cleveland on dripping liassic rocks above Ingleby Greenhow at an elevation of about 1000 feet. Known as British only before by a single patch which was found by Dr. Greville in Glen Callater in Aberdeenshire.

*Paludella squarrosa* Brid. Montane B. Range 1. In the Howardian tract in the north carr at Terrington, now nearly destroyed by drainage.

*Meesia uliginosa* Hedw. Montane A. Range 2. Found by Mr. Spruce near the Tees at Winch bridge and by Mr. Ward on a moor near the Richmond Beacon.

*Funaria hygrometrica* Hedw. Range 1-2. Common on fallows and waste ground, especially on carbonized earth, both in the low country and amongst the hills.

*Entosthodon Templetoni* Schwaegr. Montane B. Range 1. Found by myself in Cleveland at the bridge over Brocka beck, a branch of the Goathland dale stream, of the highroad between Whitby and Scarbro'.

*Physcomitrium ericetorum* De Not. Range 1-2. Frequent on rocks and shaded banks, especially amongst the hills.

*P. fasciculare* B. and S. Range 1. In the Central Vale found by Mr. Spruce on Stockton forest.

*P. pyriforme* B. and S. Range 1-2. Frequent upon damp banks in the low country and amongst the hills.

*Bartramia fontana* Brid. Montane C. Range 1-3. Frequent upon damp moors and in the neighbourhood of springs and streams, ascending from the vale heaths to the Upper zone peaks.

*B. calcarea* B. and S. Montane B. Range 1-2. Frequent about springs and streams amongst both ranges of hill, especially in the calcareous dales.

*Bartramia pomiformis* Hedw. Montane C. Range 1-3. Frequent upon shaded rocks amongst both ranges, ascending to the Main Limestone of Micklefell. In the Central Valley on banks at Tang hall near York.

*B. Halleriana* Hedw. Montane B. Range 2. In Teesdale upon shaded basaltic rocks near the High Force. On the east found by Mr. Mudd at Ingleby bank.

*B. Cederi* Swartz. Montane B. Subxerophilous. Range 2. In several places upon calcareous rocks in the western dales. In Teesdale at the White Force. In Swaledale at Keasdon force and in Cliff gill. Hell gill. In the Yore district in Mossdale and Cotterdale, and plentiful about the highest waterfall in Coverdale. On the east found by Mr. Mudd on rocks near Battersby.

*B. ithyphylla* Brid. Montane B. Range 1-3. Upon most of the Teesdale scars, ascending from the High Force to the Main Limestone of Micklefell. In Swaledale found by Mr. Ward near Marske, and in the Yore district by Mr. Brunton at Mossdale head. On the east found by Mr. Ibbotson on walls on Yearsley moor.

*B. arcuata* Brid. Montane C. Range 1-3. Frequent upon rocks and heaths amongst the hills, ascending from the vale heaths and Terrington carr to the Upper zone peaks.

*Discelium nudum* Brid. Montane B. Range 1. Found by the Rev. J. Dalton junr. in Cleveland at the foot of Kirby bank, on the left hand side of the bridle road to Bilsdale. *Catoscopium nigratum* is abundant upon Widdy bank, but is not yet ascertained, so far as known to me, in the Yorkshire portion of Teesdale.

*Splachnum ampullaceum* L. Montane B. Range 1-2. In Swaledale on Downholme moor, Ward! In Cleveland in boggy ground in Kildale, Mudd! In the Howardian tract known as a plant of Terrington carr since the time of Teesdale.

*S. sphericum* Hedw. Montane C. Range 1-3. Frequent amongst the hills, ascending from Pilmoor to the peaks of Nine Standards and Micklefell.

*Tetraplodon mnioides* B. and S. Montane B. Range 2. In Teesdale at Cronkley and Holwick, and on the slope of Micklefell towards Maze beck. On the east found by Mr. Mudd on Kildale moor and Ayton moor, and by myself on the plateau of Hambleton End.

*Fissidens viridulus* Wahl. Range 1-2. Of the plants ranged by Wilson under this species, *F. incurvus* has been gathered by Mr. Spruce in grassy places at York, by Mr. Mudd at Great Ayton, and by myself on clayey

banks at Sutton-under-Whitstoncliff; *F. pusillus* is frequent upon sandstone rocks in damp and shaded places amongst both ranges of hill; and *F. crassipes* has been gathered by Mr. Spruce at Crambeck, and by myself in the Tees at Croft, in the Swale at Topcliffe, in Codbeck at Thirsk and Kilvington, and in Guisbro' beck at Marske.

*Fissidens bryoides* Hedw. Range 1-2. Frequent upon shaded banks in the low country and amongst the hills.

*F. osmundoides* Hedw. Montane B. Range 1-2. Upon most of the Teesdale scars from the falls of Maze beck eastward to the High Force. In the West Swale district on Keasdon scars and damp rocks in Whitston-dale. On the east found by Mr. Mudd on wet rocks on Guisbro' moor and by myself in Beck hole.

*F. adiantoides* Hedw. Range 1-3. Frequent in swamps and upon damp rocks, ascending from Pilmoor and Stockton forest to the limestone pavement of Camfell and Widdale fell, and the limestone cliffs of the western face of Micklefell.

*F. taxifolius* Hedw. Range 1-2. Frequent upon shaded banks in the low country and amongst the hills.

*Schistostega osmundacea* W. and M. Montane B. Range 2. In a cavern with Tetrodontium below the Wainstones crags in Cleveland, whence it was first reported by Mr. Dalton, and where I saw it in the summer of 1859.

*Anætangium compactum* Schwaegr. Montane B. Range 1-2. In Teesdale on damp rocks at the White Force and the High Force. On the east found by Mr. Mudd in Hell gill, Guisbro' moor.

*Leucodon sciuroides* Schwaegr. Range 1-2. Common upon trees and occasionally upon walls in the low country and amongst the hills.

*Antitrichia curtipendula* Brid. Montane B. Range 1-3. Frequent upon rocks and trees amongst the hills, ascending from the Leven side at Stokesley to the Main Limestone of Widdale fell and Micklefell.

*Anomodon viticulosus* H. and T. Montane C. Subxerophilous. Range 1-2. Frequent upon limestone rocks amongst the hills on both sides of the Central Valley, and occasionally elsewhere.

*A. longifolius* Hartm. Range 1. Found by myself in 1856 with Leskea Sprucei on rocks by the side of the Tees near Eglestone Abbey just where the Main Limestone issues from beneath the Millstone Grit.

*Pterogonium gracile* Swartz. Montane A. Range 2. In Upper Swaledale on walls between Keld and Muker. It grows just beyond our limits in Teesdale upon Falcon Clints.

*Isoethecium myurum* Brid. Range 1-3. Common in shaded places, ascending from the Central Valley to the Main Limestone of Mickelfell.

*I. myosuroides* Brid. Range 1-3. Frequent in shaded places, especially amongst the hills, ascending from the Central Valley to the Main Limestone of Mickelfell.

*I. alopecurum* Wils. Range 1-2. Common in shaded and damp places in the low country and amongst the hills.

*Climacium dendroides* W. and M. Range 1-3. Common in damp places, ascending from the Central Valley to the Upper zone peaks.

*Cylindrothecium Montagnei* B. and S. Xerophilous. Range 1. In the Howardian tract in the limestone quarries at Hildenley, where it was found by Messrs. Spruce and Ibbotson. I have met with it in Teesdale on the Sugar Limestone of Widdy bank fell.

*Leskea Sprucei* Bruch. Montane A. Range 1-2. In Teesdale by the side of the stream near Winch bridge, discovered by Mr. Spruce in 1843. I have gathered it with *Anomodon longifolius* by the Tees side at Eglestone abbey, as already stated.

*L. polyantha* Hedw. Range 1. Occasionally upon trees in the low country. Aysgarth, Thirsk, Huntington, York, Askham bogs, Flazendale, Castle Howard, Crambeck, &c.

*L. pulvinata* Wahl. Range 1. On trees and bushes near the Ouse along Clifton inges near York. Discovered by Spruce in 1841.

*L. polycarpa* Ehrh. Range 1. Common upon trees and bushes in damp places in the low country.

*L. sericea* Hedw. Range 1-3. Everywhere common upon trees, roofs and stones, ascending from the Central Valley to the Upper zone peaks.

*L. subrufa* Wils. Montane A. Xerophilous. Range 2-3. Not unfrequent upon the limestone scars of the western hills and dales. Upon most of the Upper Teesdale cliffs, descending to the river side at the High Force, ascending to the limestone edges of the northern slope of Mickelfell. In Gretadale on Gilmanscar. In the West Swale district on Keasdon scars and at the waterfall in Punchard's gill. In the Yore district in Clough woods, Fossdale, and plentiful at the highest waterfall in Coverdale. Analogous in its role of dispersion to *Draba incana* and *Sesleria*.

*Hypnum nitens* Schreb. Range 1-2. In the Central Valley abundant with *H. Blandovii* in Halnaby carr. Amongst the eastern hills in Codhill bog, Flazendale and Beckdale. In the Howardian tract in the north carr at Terrington, and in a swamp below the head hag near Concysthorpe.

*H. albicans* Neck. Range 1. Frequent in the low country in sandy ground and on roofs.

*Hypnum glaucosum* Bruch. Range 1-2. Frequent in shaded places both in the low country and amongst the hills, ascending from the Central Valley to Shaw's gill above Hardraw force.

*H. lutescens* Huds. Subxerophilous. Range 1-3. Frequent upon dry banks, especially amongst the calcareous hills, ascending from the coast sandhills to the Main Limestone of Camfell and Ten End.

*H. plumosum* Swartz. Range 1-3. Frequent in damp places, especially amongst the hills, ascending to the Main Limestone of Micklefell.

*H. populeum* Swartz. Range 1-2. Frequent in shaded places, especially amongst the hills.

*H. velutinum* Hedw. Range 1-2. Frequent upon hedgebanks and in shaded places both in the low country and amongst the hills.

*H. caespitosum* Wilson. Range 1. About the roots of trees near the Ouse at York, Spruce!

*H. rutabulum* L. Range 1-3. Everywhere common in shaded places, ascending from the Central Valley to the Upper zone peaks.

*H. rivulare* Bruch. Range 1-2. Common upon damp rocks and by the side of streams in the low country and amongst the hills.

*H. crassinervium* Tayl. Range 1-2. Not unfrequent both upon dry and damp rocks amongst both ranges of hill.

*H. piliferum* Schreb. Range 1-2. Frequent in shaded places both in the low country and amongst the hills.

*H. praelongum* L. Range 1-3. Common in shaded places, ascending from the Central Valley to the Main Limestone of Micklefell.

*H. Swartzii* Turn. Range 1-2. Common in shaded places both in the low country and amongst the hills.

*H. speciosum* Brid. Range 1. Found by Mr. J. H. Davies on submerged stumps in two places in the neighbourhood of Thirsk.

*H. Teesdalii* Smith. Range 1. Found by Mr. J. H. Davies in a ditch near the east bank of Codbeck about a mile below Sowerby, and by Mr. Braithwaite in Cleveland on the banks of Rigg mill beck near Whitby. Originally published from trunks of trees in woods at Castle Howard, where it was gathered by Teesdale about 1770.

*H. pumilum* Wils. Montane B. Range 1-2. Shaded rocks amongst the hills. In the West Swale district in Punchard's gill and Billy bank wood near Richmond. In Cleveland in Crunkley gill. Upon the slope of the Hambleton range from Hambleton End to Kilburn bank. In the Howardian tract in Mowthorpe dale.

*H. striatum* Schreb. Range 1-2. Common in shaded places both in the low country and amongst the hills.

*Hypnum ruscifolium* Neck. Range 1-2. Common in streams in the low country and amongst the hills.

*H. confertum* Dicks. Range 1-2. Frequent in shaded places in the low country and amongst the hills.

*H. murale* Hedw. Range 1-3. Subxerophilous. Common upon limestone rocks, and occasionally by streamsides and in other places, ascending from the Central Valley to the Main Limestone scars of Widdale fell.

*H. tenellum* Dicks. Xerophilous. Range 1-2. Shaded calcareous rocks, rare. Found by Mr. Ward in Billy bank wood near Richmond, by Mr. Spruce at Crambeck and in Castle Howard park, and by myself at Whitstoncliffe.

*H. catenulatum* Schwaegr. Montane A. Range 2-3. In Teesdale on gritstone rocks below the Main Limestone scars of the west of Micklefell, and also sparingly near the falls of Maze beck.

*H. fluviatile* Swartz. Range 1. In the Tees at Croft and Dalton, the Swale at Topcliffe, and the Yore at Aysgarth force and Tanfield.

*H. irriguum* Wilson. Range 1. Stones by the Swale at Aisenby and by the Yore at Tanfield.

*H. elodes* Spruce. Range 1. Damp sandy ground on Stockton forest and in the Howardian tract in Gilla-leys wood.

*H. serpens* L. including *radicale* Beauv. Range 1-2. Common in shaded places in the low country and amongst the hills.

*H. riparium* L. Range 1. Common by streamsides and in damp places in the low country.

*H. polygamum* B. and S. Range 1. Found by Mr. J. H. Davies in swampy ground in Sowerby Flatts near Thirsk, and by myself with *Pottia Heimii* by the Esk side near Whitby.

*H. stellatum* Schreb. Range 1-3. Common upon shaded rocks and swampy heaths, ascending from Pilmoor and Stockton forest to the Upper zone peaks.

*H. chrysophyllum* Brid. Range 1-2. Not unfrequent in sandy ground and upon calcareous rocks in shaded places.

*H. polymorphum* Hedw. Range 1. In the Howardian tract found by Mr. Spruce on dripping rocks at Crambeck.

*H. heteropterum* Bruch. Montane B. Range 1-3. Frequent on shaded rocks amongst both ranges of hill, ascending from Cock mill woods near Whitby to the Main Limestone of Micklefell.

*H. palustre* L. Range 1-3. Common on damp rocks and by the side of streams, ascending to the tarn on the end of the fell on the north of the

source of the Swale. *H. atrovirens* Flora p. 140 is a form of this species. *H. molle* is reported by Teesdale from rocks at Crambeck, doubtless in error.

*Hypnum stramineum* Dicks. Range 1-2. Somewhat rare in swampy ground. On the west near the Lunedale Tarn. In the Central Vale in Halnaby carr. On the east in Kildale, Sleddale, Rosedale and Brantsdale, on Guisbro', Kirby and Carlton moors, and in Terrington carr.

*H. sarmentosum* Wahl. Montane A. Range 2. Gathered by myself in 1856 in damp ground on the slope of Micklefell towards Maze beck.

*H. cordifolium* Hedw. Range 1-2. Frequent in swampy ground, especially amongst the hills.

*H. giganteum* Schwaegr. Range 1. Rare in swamps. Found by Mr. Mudd in Sleddale, and by Mr. Davies in a bog near Whitstoncliff.

*H. cuspidatum* L. Range 1-3. Everywhere common in damp places, ascending from the Central Valley to the Upper zone peaks.

*H. Schreberi* Willd. Range 1-3. Common upon heaths and hedgebanks, ascending from the Central Valley to the Upper zone peaks.

*H. purum* L. Range 1-3. Everywhere common in shaded and damp places, ascending from the Central Valley to the Upper zone peaks.

*H. Blandovii* W. and M. Range 1. In the Central Valley plentiful in Halnaby carr. In the Howardian tract in the north carr at Terrington.

*H. delicatulum* L. Xerophilous. Range 1. In the limestone quarry at Hildenley with *Cylindrothecium Montagnei*.

*H. tamariscinum* Hedw. Range 1-3. Everywhere common in shaded and damp places, ascending from the Central Valley to the Upper zone peaks.

*H. splendens* Hedw. Range 1-3. Everywhere common in shaded and damp places, ascending from the Central Valley to the Upper zone peaks.

*H. brevirostre* Ehrh. Range 1-2. On the west in Gunnerside gill and woods near Richmond. On the east in Whitstoncliffe woods and in Mowthorpe dale and Castle Howard park.

*H. flagellare* Dicks. Montane B. Range 1-2. Frequent upon rocks in the streams amongst both ranges of hill.

*H. triquetrum* L. Range 1-3. Everywhere common in shaded places, ascending from the Central Valley to the Upper zone peaks.

*H. loreum* L. Range 1-3. Frequent in shaded places, especially amongst the hills, ascending to the Upper zone peaks.

*H. squarrosum* L. Range 1-3. Everywhere common in damp places, ascending from the Central Valley to the Upper zone peaks.



*Hypnum fluitans* L. Range 1-3. Common in swamps and peat bogs, ascending from the vale heaths to the Upper zone peaks.

*H. revolvens* Swartz. Range 1-3. In similar situations to the preceding, and with as wide a vertical range, but less frequent.

*H. exannulatum* Gumbel. Montane B. Range 2. Swamps amongst the hills, rare. In the west about the tarn in Lunedale, and between Cronkley scars and the Tees. In the east at the head of the Ingleby branch of the Leven.

*H. Kneiffi* Schimp. Range 1. In the Central Valley in a swamp near the foot road about a mile from Thirsk, in the direction of Bagby.

*H. lycopodioides* Neck. Range 1. In the west on the banks of Seamer water. Plentiful with *H. scorpioides* in swamps on Pilmoor and Stockton forest. *H. rugosum* is abundant in Teesdale on the Sugar Limestone of Widdy bank.

*H. filicinum* L. Range 1-2. Common in damp places, ascending from the Central Valley to the plateau of Pin Seat. The *var. vallisclausæ* is plentiful in the streams in Yowlasdale and Flazendale.

*H. commutatum* Hedw. Range 1-3. Frequent in damp places and on dripping rocks, from the Central Valley to the Upper zone peaks. The *var. condensatum* is common at all levels upon swampy heaths.

*H. uncinatum* Hedw. Range 1-2. Frequent in damp places and on dripping rocks, especially amongst the hills.

*H. Crista-castrensis* L. Montane C. Range 1-3. In Teesdale amongst the heather on the edge of Cronkley fell, *Black!* On the south side of the Tees near Gainford, *Backhouse*. In the Central Valley in woods near Croft, *Dalton*. In the Howardian tract in a hollow near the entrance from Ganthorpe into Castle Howard park.

*H. molluscum* Hedw. Range 1-3. Common upon rocks and on shaded banks amongst the hills, ascending to the Main Limestone of Micklefell and the limestone pavement of Camfell and Widdale fell.

*H. hamulosum* Swartz. Montane A. Range 2. In Teesdale upon Holwick scars, *Black!*

*H. cupressiforme* L. Range 1-3. Common upon trees and rocks, ascending from the Central Valley to the Upper zone peaks. The *var. compressum* was found by Mr. Spruce in the Howardian tract on Scakleton moor.

*H. resupinatum* Wils. Range 1. Frequent upon trees and stones in the low country.

*H. pratense* Brid. Range 1. Damp grassy places in the low country. On the west near the Yore between Masham and Tanfield. In the Central

Valley between Sowerby and Dalton, and near the Tees at Croft. In the Vale of Mowbray in Gurtof gill, and at the foot of Black moor near Westow.

*Hypnum ochraceum* Turn. Range 1. In Bilsdale on rocks in the streamlet which flows into the main stream from the north end of Easterside.

*H. scorpioides* L. Montane C. Range 1-2. Frequent on swampy heaths amongst the hills, descending to Terrington carr and Stockton forest.

*H. incurvatum* Brid. Montane A. Range 2 In Teesdale on stones in the bed of the stream below the High Force.

*H. pulchellum* Dicks. Montane A. Range 1-2. Shaded rocks in the western dales. Upon most of the Teesdale scars from Cronkley fell eastward to Crossthwaite beck. In the West Swale district in Whitstondale and Punchard's gill. In the Yore district at the upper falls of Cotterdale.

*H. Silesiacum* W. and M. Range 1. In Eskdale gathered by Mr. Spruce on rocks in Arncliffe wood near Egton bridge.

*H. undulatum* L. Range 1-3. Common in damp and shaded places amongst the hills, ascending to the Upper zone peaks.

*H. sylvaticum* L. Range 1-3. Common in shaded places, ascending from the Central Valley to the Main Limestone of Micklefell.

*H. denticulatum* L. Range 1-2. Common in damp and shaded places, especially amongst the hills.

*H. elegans* Hook. Montane B. Range 1-2. Frequent on shaded rocks amongst both ranges of hill.

*H. depressum* Bruch. Montane B. Range 1-2. Shaded rocks, rare. Stones in the lower part of Balderdale. In the Vale of Mowbray in Stonecliffe wood. Frequent both in the glens and upon the western and southern slope of the Hambleton hills. In the Howardian tract in several stations.

*Omalia trichomanoides* Brid. Range 1-2. Common upon trees and sometimes upon walls, both in the low country and amongst the hills.

*Neckera complanata* B. and S. Range 1-2. Common in similar situations to the preceding, ascending to the Main Limestone scars of Punchard's gill.

*N. crispa* Hedw. Montane B. Xerophilous. Range 1-3. Common upon rocks amongst the calcareous hills on both sides of the Central Valley, ascending from the Magnesian Limestone to the limestone pavement of Camfell and Widdale fell. Amongst the eastern arenaceous hills in the upper part of Farndale, Mudd. See remarks under *Trichostomum flexicaule*.

*Neckera pumila* Hedw. Range 1-2. In Teesdale in Holwick woods, Spruce. In the Howardian tract in Ray wood and Gilla leys wood.

*Hookeria lucens* Smith. Range 1-2. Frequent in damp places amongst both ranges of hill.

*Cryphæa heteromalla* Brid. Range 1. Upon trees in the low country in several places. Croft, Thirsk, Carlton in Cleveland, Egton bridge, Ampleforth, Castle Howard, &c.

*Fontinalis antipyretica* L. Range 1-2. Common in streams in the low country and amongst the hills, ascending to the plateau of Holwick fell.

*F. squamosa* L. Montane B. Range 1-2. Streams amongst the hills, rare. In Teesdale in the Tees from Upper Cronkley downwards. On the east in Baysdale beck, in the Esk below Castleton, and in Bilsdale beck at Laskill bridge.

SUMMARY. In this chapter 309 species are included, 278 of which are ascertained to occur in the Lower, 223 in the Middle, and 87 in the Upper zone. One hundred species range under the Montane role of distribution, (Montane A 27, Montane B 60, Montane C 13), whilst 7 species are characteristically and 5 species less typically Xerophilous, and 3 species exclusively Maritime in the stations which they affect.

## APPENDIX B.

### LIST OF AUTHORITIES FOR DETAILS OF THE TOPOGRAPHY OF PLANTS.

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#### PUBLISHED BOOKS.

*Turner and Dillwyn's Botanist's Guide*, published in 1805. Upwards of 80 pages of this work are devoted to Yorkshire. Teesdale's list in the second and fifth volume of Linnean Transactions is the basis of the Catalogue. Teesdale resided for many years at Castle Howard, as gardener to the Earl of Carlisle. For stations within our limits the other principal contributors are Brunton (of Ripon), Dalton (Coppgrove), and Pierson (Coxwold).

*Watson's New Botanist's Guide*, Vol. 1 (1835). The principal new notices for North Yorkshire contained here are furnished by Mr. James Ward, of Richmond; and a few others by Messrs. Winch, Bloxam, R. B. Bowman and Leefe. Vol. 2 (1837) contains a few supplementary notices, mainly from the same sources.

*Flora of Yorkshire*, edited by Henry Baines, of York (1840). The principal new contributions for the North Riding are furnished by Messrs. Hinckes, Backhouse, and Moore (all three of York), Hailstone (Bradford), Williamson, and Munby (Scarbro'), Wasse (Thirsk), Spruce and Ibbotson (for the Howardian tract). Many stations are also quoted from the herbarium of the Yorkshire Philosophical Society, the specimens in which were contributed by Messrs. Dalton (see above), Backhouse, and Middleton (Poppleton). Several of the lists which were used are in my possession, and where this is the case I have quoted them direct.

*Supplement to the Flora of Yorkshire* (1854). The lists for the Mosses were edited by John Nowell of Todmorden: those for the Flowering Plants and Ferns by myself. For contributors see under.

*Barker's Three Days in Wensleydale* contains a list of plants, drawn up by Dr. Fothergill of Carr-end, probably at least fifty years ago.

*Brewster's History of Stockton-on-Tees.* The second edition contains a list of the plants of the neighbourhood, by Mr. John Hogg, F.L.S. of Norton House.

*Robinson's Guide to Richmond* contains a copious list of the rare plants of the neighbourhood by Mr. James Ward.

*Theakstone's Guide to Scarbro'* contains a copious list of the rare plants of the neighbourhood, by Mr. William Bean.

*Ferguson's Natural History of Redcar* contains a good list of the rarer plants of the neighbourhood, drawn up by the author.

*Grainge's Vale of Mowbray* contains a paper by myself on the botany and physical geography of that tract of country.

PAPERS IN JOURNALS, HERBARIA CONSULTED, MANUSCRIPT  
CONTRIBUTIONS, &c.

*Addison* (Rev. F.), formerly of Thirsk, now of Cleator near Whitehaven. After Dr. Wasse, the first explorer, in conjunction with Mr. W. Dale, now of Plymouth, of the botany of the neighbourhood of Thirsk; and the guide of Mr. W. Foggitt and myself to many of the stations of the rarities.

*Anderson* (Mr.), of Whitby. List of some of the rarer plants of the neighbourhood of Whitby, in the Whitby Advertiser of July 3rd, 1858.

*Backhouse*, James, and James junior, of York, father and son, the latter the author of a Monograph of the British Hieracia. See above. Also notices and specimens, principally from Teesdale and the neighbourhood of York. The discoverers of several of our Montane rarities, and both occasionally my companions upon excursions.

*Bean*, William, William junr., and Eugene, of Scarbro', the latter formerly of Thirsk, the two latter sons of the first mentioned. See above. Numerous specimens from the neighbourhood of Scarbro'.

*Black* (Dr. A. O.), of London. Sundry notices and specimens of rare species from Scarbro' and Teesdale.

*Borrer* (W.), of Henfield, Sussex, the well-known botanist, lately deceased. The discoverer, during casual visits to North Yorkshire, of several rarities.

*Carter* (Thos.), of Masham. Sundry notices of rare plants of the neighbourhood of Masham.

*Clemesha* (W. H.) formerly of Guisbro'. Herbarium, principally collected in the neighbourhood of Guisbro', and marked list of species observed in the Esk district.

*Davies* (John H.), formerly of Thirsk, now of Lisburn, Co. Antrim. Frequently my companion upon excursions, and the discoverer of several of the rarer Mosses of the neighbourhood of Thirsk.

*Dalton junr.* (Rev. Jas.), formerly of Ingleby Greenhow. Grandson of the well-known botanist of the same name. Author of a paper in the *Naturalist* on some of the rarer Mosses of Cleveland.

*Foggitt*, Thos. J., and William, of Thirsk, the latter the son of the former. Numerous notices and specimens, especially from the neighbourhood of Thirsk. The latter my most frequent companion on excursions.

*Hartas*, (Isaac), of Ravenswyke Hall near Kirby moorside. Herbarium, containing numerous specimens from the Derwent district.

*Hebblethwaite* (Mr.), of Camp hill near Kirklington. Numerous specimens from that neighbourhood.

*Ibbotson* (Henry), formerly of Ganthorp, now of York. See above; also list in the *Phytologist* of the rarer Flowering Plants and Mosses of the neighbourhood of Castle Howard, and various notices and specimens from different parts of North Yorkshire.

*Milnthorpe* (Dr.), late of Topcliffe. My guide to the localities of several of the rarer plants of the neighbourhood of Topcliffe.

*Moore* (Oswald A.), late of York. See above; also editor, in conjunction with Mr. Baines, of a Report on the Plants of Yorkshire, prepared for the meeting of the British Association at York, in 1844. This catalogue is now in my possession, and contains notes of stations observed both by Mr. Moore himself, and by Messrs. Pulleine, G. E. Smith, Cramond and other botanists, who are mentioned in this list.

*Mudd* (William) of Great Ayton near Stokesley, author of a Manual of the British Lichens. List of Cleveland plants, with localities for the rarities. Marked catalogues for the East Tees and Esk drainage districts. Numerous specimens both of Flowering Plants and Mosses from different parts of Cleveland.

*Middleton* (R. M. tertius), of Northallerton. Herbarium, gathered principally in that neighbourhood.

*Phillips* (John H.), of Beadlam grange near Helmsley. Notices of several rare plants of the neighbourhood of Helmsley.

*Reynolds* (Frederic), of Ayton near Hackness. List of the rarer plants of the neighbourhood of Hackness, with specimens of *Convallaria bifolia* and other species.

*Simpson* (Thomas), of Hopetown near Bedale. List of rare species, principally of the neighbourhood of Bedale and specimens of some of them.

*Slater* (Matthew), of Malton. Herbarium of Flowering Plants and specimens of Mosses, principally collected in the neighbourhood of Malton.

*Spruce* (Richard), formerly of Ganthorpe, the well-known botanical collector, now resident in Guatemala. See above; also lists and notices, principally relative to the Mosses of North Yorkshire, in the *Phytologist* and *Transactions of the Edinburgh Botanical Society*. The first to open the rich bryology of Upper Teesdale, and the discoverer of numerous rare and some new species.

*Umpleby* (Mr.), of Mawnby. Collection of specimens gathered principally at Kirby Wiske and Middlesbro'.

*Ward* (James), of Richmond. See above; also various manuscript notices, marked list for the West Swale district, herbarium in part, and specimens, especially of Willows, from the neighbourhood of Richmond.

*Wheldon* (William), of Northallerton. Herbarium gathered principally in that neighbourhood.

*Wilson* (William), of Warrington, author of the *Bryologia*. The discoverer, during casual visits to North Yorkshire, of *Campylopus brevipilus*, *Sphagnum rubellum*, and other rare Mosses, with specimens of which he has obligingly furnished me.

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